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AUTHOR McGuire, Michael D.; Price, Jane A.
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ABSTRACT

This study looked at future demand for faculty at institutions of higher education by developing a larger and more sophisticated model of faculty demand than previously used and by examining faculty separation and hiring patterns among independent colleges and universities. All members of the Higher Education Data Sharing Consortium (125 independent colleges and universities in the nation that collaborate on comparative research studies) were invited to contribute data to the study which consisted of two parts: an institutional survey of faculty separation and hiring practices and a faculty data base. Additional qualitative data from a survey of department chairs and an annual Senior Survey were obtained at Franklin and Marshall College only. The major findings indicated that the rate of faculty retirements is projected to increase significantly over the next 20 years with the largest wave of retirements projected to occur from 1999 through the first decade of the next century. In addition, the amount of faculty hiring activity will increase significantly in the years ahead, but due to other factors, the net impact on national supply may be sharply attenuated. Included are 12 tables, 18 charts and 14 references. (JB)

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Previewing the Professoriate of the 21st Century: A Multi-Institutional Analysis of Faculty Supply and Demand[1]

Michael D. McGuire and Jane A. Price
Franklin and Marshall College

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Previewing the Professoriate of the 21st Century: A Multi-Institutional Analysis of Faculty Supply and Demand[1]

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Introduction

Over the past two years several independent studies have been conducted in an attempt to specify the nature, scope, and timing of anticipated shortages of college and university faculty in the 1990's and beyond. In addition to numerous editorials and position papers, relevant research evidence has been supplied by the ACE Campus Trends 1989 survey (El-Khawas, 1989), a faculty flow model for 19 institutions in a state university system (Daigle & Rutemiller, 1989), a large community college system's faculty retirement study (Parke, 1988), a study of faculty age and attrition patterns at 29 private colleges and universities (McGuire & Price, 1989), preliminary data from the Project on Faculty Retirement (Rees & Smith, 1989), a study of faculty retirement trends at 24 universities (Lozier and Dooris,1989) and at 101 colleges and universities (Lozier and Dooris,1990), and a comprehensive analysis of data from the National Research Council and other sources on faculty supply and demand issues (Bowen & Sosa, 1989). This new information has expanded upon the findings of earlier research efforts, most notably the work of Cartter (1976) and Bowen and Schuster (1986). [NOTE: A comprehensive review of the literature on faculty supply and demand will be available in the Fall of 1990 — see WICHE, 1990.]

Taken together, these studies are generally consistent in their overall projections of a heightened demand for new faculty in U.S. higher education over the next two decades. Research that examines faculty hiring needs via the perceptions of current administrators (El-Khawas, 1989), or that models faculty hiring needs within a single high-growth system (Daigle & Rutemiller, 1989), tends to find short-range gaps between faculty supply and demand that have already begun to impact search and hiring patterns. Those relying on demographic projection methods (Bowen & Sosa, 1989; Lozier and Dooris,1990; McGuire & Price, 1989) foresee a more acute problem later in the 1990's and early part of the next century.

There is considerable convergence among the latter studies, surprisingly so given dissimilarities in the methods used. Although their projections differ somewhat in terms of

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[1] This is a pre-conference draft of a paper to be presented at the 25th annual meeting of the Society for College and University Planning, August 1, 1990, in Atlanta, Georgia.

the nature, timing, and degree of expected shortfalls, they basically agree that the late 1990's and early 2000's will witness significant increases in demand for new faculty. Bowen & Sosa predicted acute shortages in the humanities and social sciences, with the greatest problem occurring after the year 2002; Lozier and Dooris (1990) predicted moderate increases in retirement rates in selected disciplines, and decreases in other disciplines, between 1988 and 2003; McGuire & Price, on the other hand, predicted that heightened demand for faculty in the natural sciences would eclipse that in other academic domains around the year 2000, but did not predict the extent to which faculty supply will lag behind demand in the years ahead.

While recent evidence has begun to substantiate widespread fears of impending faculty shortages, additional research is needed to monitor this potential crisis for several reasons. First, empirical studies on the topic are relatively few and recent; given the complex nature and potentially traumatic impact of shifts in faculty demographics, such changes warrant more thorough analysis using larger, more representative samples of institutions. Second, the probability that faculty shortages will not effect all institutions to the same degree suggests the need to examine projected demand specifically by academic discipline, institutional type, and geographic region. Intervention strategies may be more efficiently targeted at areas with the most acute need, to avoid producing an oversupply of faculty in low-need disciplines, institutions, and regions.

Third, longitudinal monitoring of demographic projection models is necessary to adjust for measurement error and thereby refine projection models and their often tenuous assumptions. It is also likely that the true impact of even accurate faculty demand projections may be different than expected: an increase in the supply of traditional and/or non-traditional college faculty might significantly curtail potential shortages. Finally, it is important to examine actual rather than theoretical faculty hiring practices and preferences in order to define the true faculty labor market. Traditional assumptions about the sources of new faculty may not be accurate in the 1990's, at least in certain sectors of U.S. higher education.

Faculty supply data have tended to be even sparser and more volatile than demand data. Doomsday predictions of severe faculty shortages may well be based on erroneous assumptions about the future rate of Ph.D. production, and about over-reliance on new Ph.D.'s rather than other types or sources of faculty when replacing or adding faculty members. The purpose of the present study was to develop a larger and more sophisticated model of faculty demand than that reported in McGuire & Price (1989), and to examine faculty separation and hiring patterns among independent colleges and universities.

Method

Overview: Participants in this study were members of the Higher Education Data Sharing (HEDS) Consortium, a group of approximately 125 independent colleges and universities in the U.S. that collaborate on comparative research studies. All members were invited to contribute data to the present study, which consisted of two parts: an institutional survey on faculty separation and hiring practices, and a faculty database. Additional qualitative data from a survey of department chairs and an annual Senior Survey were obtained at Franklin and Marshall College only.

A common definition of "full-time faculty" was not used in this study. For this reason, data from institutions using a more restrictive definition (e.g., AAUP criteria) may underestimate the size of the faculties and consequently of future hiring needs at those institutions.

Faculty Separation and Hiring Survey: Forty-six (46) institutions completed this survey, which consisted of 5 items: 1) the annual rate of full-time faculty attrition, by rank, for different reasons (death/disability, retirement, failure to be tenured/reappointed, voluntary resignation, promotion within the institution, etc.); 2) the anticipated growth of the institution's total full-time faculty over the next ten years; 3) the number of full-time faculty retirees in 1989, and their age upon retirement; 4) the percentage of full-time faculty who left the institution in 1989 who then moved on to a full-time faculty position at another institution; and 5) the percentage of full-time faculty hires in 1989 who were either new Ph.D.'s, A.B.D.'s, full-time faculty at another institution, part-time faculty at that or another institution, or employed outside of academe, immediately prior to the new appointment.

Completed surveys were edited carefully and discrepancies were resolved in conference with the participants. Using the Carnegie Classification system, of the 46 contributing institutions, 38 (82.6%) were Liberal Arts Colleges, 3 (6.5%) were Comprehensive Universities, 3 (6.5%) were Doctoral Universities, and 2 (4.4%) were Research Universities. The distribution of full-time faculty members represented by this sample was somewhat different: 4,374 (65.3%) at Liberal Arts Colleges, 436 (6.5%) at Comprehensive Universities, 860 (12.8%) at Doctoral Universities, and 1,033 (15.4%) at Research Universities.

Faculty Database: Forty-five (45) institutions provided a file containing the following data on individual faculty members in 1989-90: academic department, age, rank, gender,

ethnicity, appointment year, year that current rank was achieved, and year of terminal degree. The purpose of this file was to provide descriptive information on the characteristics of the faculty in the study, and to project retirements of faculty in the academic disciplines based on actual age distributions.

Of the 45 contributing institutions, 35 (77.8%) were Liberal Arts Colleges, 4 (8.9%) were Comprehensive Universities, 2 (4.4%) were Doctoral Universities, and 4 (8.9%) were Research Universities. Again, the distribution of full-time faculty members represented by this sample was somewhat different: 4,090 (50.8%) at Liberal Arts Colleges, 623 (7.7%) at Comprehensive Universities, 619 (7.7%) at Doctoral Universities, and 2,718 (33.8%) at Research Universities. Thirty-eight (38) institutions provided both the faculty survey and faculty database; seven (7) provided the database only, while eight (8) provided survey data only.

Supplemental Data: In an effort to gather additional information on the actual and potential faculty labor markets, a survey of department chairs was conducted at Franklin and Marshall College. The questionnaire consisted of both multiple choice and open-ended questions addressing 3 topics: the perceived size and quality of recent applicants for faculty positions at F&M overall and from each of several sources (Ph.D. programs, other institutions' faculties, business or industry); possible reasons for perceived declines in the size or quality of the applicant pool, for increases in the time to Ph.D. completion, and for loss of interest in academic careers among recent undergraduate cohorts; and strategies for increasing the size, quality, and diversity of faculty applicant pools (including the viability of recruitment from non-academic sectors).

The annual survey completed by graduating seniors at Franklin and Marshall in the spring of 1990 also included questions on students' post-baccalaureate educational and career plans, and specifically their interest in pursuing a career as a college professor (and if not, why not). While data from these two local surveys may not be representative of the experiences of faculty and students at other institutions, it was hoped that they would at least provide some additional ideas on the prospects for faculty supply in the near future.

Results

A. Separation and Growth Rates: Table 1 lists the median separation rates from the first item on the Faculty Separation and Hiring Survey. Forty-five (45) institutions provided these data.

Table 1

Mean Annual Faculty Separation Rates

Reasons	Full	Associate	Assistant
Death/Disability	0.62%	0.32%	0.16%
Retirement	4.03%	0.95%	0.14%
Voluntary Resignation	0.72%	1.36%	4.84%
Contract Not Renewed	0.08%	0.47%	3.48%
All Reasons	**5.45%**	**3.10%**	**8.62%**
Promotion	0.00%	8.63%	7.69%

For the purposes of the faculty hiring needs model, the following **median** separation rates (excluding retirements) were used: **Full (1.29%), Associate (2.43%), and Assistant (9.31%).** Median promotion rates of 7.61% (Associate to Full) and 6.99% (Assistant to Associate) were also used in the model. Medians were selected instead of means to reduce the distortive effect of outlying institutions and missing data in the distributions of separation rates.

The second item on the Faculty Separation and Hiring Survey asked each institution for their expected annual rate of full-time faculty growth over the next decade. Results indicated that 31 of 43 respondents (72%) anticipated positive growth in the total size of their faculties in the years ahead. Eleven (26%) anticipated no growth, and only one (2%) expected a decline in number of full-time faculty through the 1990's. A weighted average **annual growth rate of 0.86%** was used in the faculty hiring needs model.

The third item on the Faculty Separation and Hiring Survey requested the number and ages at retirement of faculty retirees in 1989. A total of 114 faculty from 38 institutions in the sample retired in 1989, with an **average age at retirement of 65.03 years.** The distribution of retirees by year is presented in Table 2. A retirement rate (i.e., the percentage of faculty "surviving" to a given age who retire at that age) was also computed and applied to the faculty

database to project retirements by age and year for the faculty hiring needs model. The retirement age distribution was roughly symmetrical and near-normal, with a mean, median, and mode of 65 years.

Table 2

Age Distribution of 1989 Faculty Retirees

Age at Retirement	Number	Percent
< 60	5	4.4%
60	5	4.4%
61	9	7.9%
62	10	8.8%
63	6	5.3%
64	11	9.6%
65	22	19.3%
66	12	10.5%
67	5	4.4%
68	9	7.9%
69	2	1.8%
70	13	11.4%
> 70	5	4.4%

The fourth item on the Faculty Separation and Hiring Survey requested an estimate of the percentage of faculty leaving that institution in 1989 who moved on to full-time faculty positions elsewhere. Forty-five (45) institutions provided these data, which ranged from 0% to 100%, with an unweighted mean of 52.74%, a weighted mean of 56.86%, and a median of 50%.

The fifth item on the Faculty Separation and Hiring Survey requested the percentage of new full-time faculty hires in 1989 who arrived from each of 5 sources or labor pools: new doctorates, A.B.D.'s, full-time faculty appointments at another institution, part-time faculty appointments at this or another institution, and sectors outside of higher education (business, industry, government, primary or secondary education, self-employment, etc.). The weighted means for each category are listed in Table 3. Fewer than half of the new faculty appointments came directly from graduate programs either before (13%) or after (29%) completing their doctorates. Over half were already employed as faculty in higher education on a full-time (43%) or part-time (10%) basis.

Table 3

Percentage of New Full-time Faculty Hires by Source

Source	Number	Percent
New Doctorates	183	28.9%
A.B.D.'s	84	13.3%
Previous FT Faculty	271	42.8%
Previous PT Faculty	61	9.6%
Outside of Higher Ed	35	5.5%

B. Faculty Database: A sample of 45 institutions supplied a data file containing information on each of their 8,050 full-time faculty members. Fields in this database included date of birth, academic discipline, current (1989-90) rank, gender, ethnicity, year of terminal degree, year of first faculty appointment at that institution, and year of promotion to current rank. A summary of these characteristics is presented in Tables 4 and 5.

Table 4

Faculty Characteristics by Rank

Categorical Variables

	Rank				
	Full	Associate	Assistant	Instructor	Total
Academic Domain					
Humanities	931	734	727	136	2,528
Natural Sciences	801	456	467	23	1,747
Social Sciences	1,057	734	801	93	2,685
Other	423	294	284	52	1,053
Total	**3,212**	**2,218**	**2,279**	**304**	**8,013**
Gender					
Female	12%	26%	39%	52%	25%
Male	88%	74%	61%	48%	75%
Ethnicity					
American Indian	0%	<1%	<1%	0%	<1%
Asian	2%	3%	6%	6%	3%
Black	1%	2%	3%	3%	2%
Hispanic	1%	2%	3%	6%	2%
White	95%	93%	89%	84%	92%
Other/Unknown	<1%	<1%	<1%	1%	<1%

Notes: 37 faculty in database had unknown rank.
Percentages may not add to 100 due to rounding.

Table 5

Median Faculty Characteristics by Rank

Numeric Variables

	Rank			
	Full	Associate	Assistant	Instructor
N	3,212	2,218	2,279	304
Age	53	44	37	35
Terminal Degree	1967	1976	1985	1984
First Appointment	1969	1979	1987	1988
Current Rank	1980	1985	1987	1988

Note: The N for some cells was smaller than listed due to missing data; in particular, year of terminal degree was missing for over 50% of the faculty in each rank.

The distibutions of faculty age, appointment year, and terminal degree year are included in Charts 1 - 3. In terms of intercorrelations among these variables, age is highly correlated with terminal degree year (-.87) and appointment year (-.78), as is terminal degree year with appointment year (+.84). Finally, appointment year by gender and ethnicity are plotted in Charts 4 - 5. Not surprisingly, these distributions illustrate the dramatic increases in the hiring of women and minority faculty in the 1970's and 1980's. The large group of faculty hires in the 1960's who will be retiring in the 1990's and beyond, on the other hand, were predominantly white males.

C. Faculty Hiring Needs Model, All Faculty: The survey and database information was combined to provide input to the faculty hiring needs model, which is summarized for all disciplines (Tables 6-8), the Humanities (Table 9), the Natural Sciences (Table 10), and the Social Sciences (Table 11). The following assumptions were used in the model:

- Total faculty size would grow at an annual rate of 0.86%;
- Faculty retirements were based on a probability matrix determined from the retirement age distribution above;
- Faculty non-retirement separation rates were based on the median values from the Faculty Separation and Hiring Survey for each rank: Full (1.29%), Associate (2.43%), and Assistant (9.31%);
- Faculty promotion rates were also based on median values from the Faculty Separation and Hiring Survey for each rank: 7.61% (Associate to Full) and 6.99% (Assistant to Associate);
- All new and replacement faculty were hired at the rank of Assistant professor in the model.

While the hiring of faculty at advanced ranks is not uncommon (and may in fact be increasing, in absolute if not relative terms), the most conservative assumption in the absence of data to the contrary was to keep all new hires at the assistant rank. One implication of this assumption is that the new faculty hires will not reach retirement age within the 20-year span of the projection model, resulting in an underestimation of total retirements during that time. On the other hand, as assistant professors they are hired into the rank with the highest non-retirement separation rate, thus producing an overestimation of faculty loss for other reasons. The model cannot yet specify the extent to which these trends cancel each other out.

Table 6 illustrates how the model charts faculty flow by rank over time. Tables 7 and 8 contain projections for positive growth and no growth assumptions (the following discussion will focus primarily on the positive growth scenario, since data from this and other studies indicate that some expansion of our nation's faculties will occur into and beyond the next decade). The results indicate a short-term decrease in the number and proportion of faculty retirees from 1991 to 1994, followed by a steady increase in their numbers through the year 2008. Overall the annual numbers of faculty retirees is projected to increase by 37% over the next 20 years. Total faculty separations for retirement and non-retirement reasons combined (net loss) is projected to increase by 42% with no short-term dip over the same time period. Finally, the "bottom line" — total annual faculty hires (additions and replacements) — is projected to increase by 39%, or annually from 7.1% to 8.3% of all faculty, between 1990 and 2010. These trends are illustrated in Charts 6 - 7. It is also interesting to note that a significant proportion of future faculty hiring needs — 34% to 37% — may be fulfilled by rehiring faculty who have separated from other institutions.

D. Faculty Hiring Needs By Academic Discipline: Projections of overall hiring needs provide only a crude measure of future demand for faculty, since there will almost certainly be differences across academic disciplines in the number and rate of retirements, non-retirement separations, growth in enrollments and new faculty positions, and competition from non-academic employers both before and during an individual's appointment to a college's faculty. The present study examined discipline-specific faculty hiring needs data from 2 perspectives: the projection of faculty retirements, total separations, and hiring needs over the next 20 years for the 3 traditional academic divisions or domains in the Arts and Sciences (the Natural Sciences, Social Sciences, and Humanities — see Tables 9 - 11), and differential age, rank, gender, and ethnicity distributions for specific disciplines within these domains (Table 12).

The full hiring needs model was not applied to individual disciplines for two reasons: the number of faculty in many disciplines was too small for reliable projections, and more importantly, there were no systematic data from this or any other study on differential attrition, promotion, and growth rates by academic discipline. For example, one might expect a greater number of separations through loss to other sectors (i.e., business and industry) and other institutions of higher education among the natural sciences, business administration, economics, and engineering. The Humanities disciplines, on the other hand, might be expected to have a considerably lower non-retirement separation rate. Growth patterns across disciplines are also difficult to predict reliably, driven as they are by cyclical changes in later employment opportunities, popularity among students, roles within the curriculum (support vs. major concentration emphases), and other factors. Certainly, future research on faculty supply and demand should collect more specific data at the individual discipline level. In the interim, the age and rank distributions should be sufficient for infering relative differences in hiring needs since they are the two variables that account for temporal variability in faculty loss in the overall model.

It is apparent from the data in Tables 9 - 12 and in Charts 8 - 13 that the overall increases in demand for faculty over the next 20 years will impact different disciplines to different degrees and at different times. The 20-year increase in annual retirements is largest in the Social Sciences, while the increase for total separations and hiring needs are highest in the Natural Sciences. The latter finding is a function of disproportionately larger numbers of retirees and of faculty at the assistant professor rank in the later years of the study, since this rank has a higher non-retirement separation rate than full and associate professors. Obviously, changes in tenure and promotion policies, and in the tendency to hire new faculty at advanced ranks rather than as assistant professors, will influence the accuracy of these projections. On a related issue, the percentage of faculty separators available for hire by other institutions is relatively stable across time and academic domain, ranging from approximately 34% to 38% per year.

The Social Sciences and Humanities have a similar pattern of relative hiring needs (i.e., number of new hires as a percentage of all faculty) over time, with stable rates in the early to late 1990's before experiencing a steady increase through the first decade of the next century. At all times the Humanities have relatively greater hiring needs than the Social Sciences. In contrast, the Natural Sciences initially have the smallest relative hiring needs but climb steadily through the 1990's until the year 2005, when they appear to stabilize. Around 1996 the Natural Sciences eclipse, and around 2006 they are re-eclipsed by, the Social

Sciences (Chart 8). It is also interesting to note that the differences in hiring needs among the three domains are considerably smaller in 2010 than in 1990.

When the 20-year period from 1990 to 2010 is partitioned into 5-year blocks of time, some interesting trends emerge. For all disciplines combined, the late 1990's are projected to have 5% fewer faculty retirements than the early 1990's but will be followed by a 43% increase in retirements in the first decade of the next century relative to the late 1990's. The comparable figures for the separate academic domains are -6% and +39% for the Humanities, +6% and +28% for ther Natural Sciences, -10% and +62% for the Social Sciences, and -7% and +33% for Professional and Other Disciplines. In other words, the critical period for increased retirement rates will occur early in the next century rather than later in this one, and the Social Sciences and Humanities may be especially hard-hit by the suddent changes projected to occur then.

In terms of the age distributions of and retirement expectations for specific disciplines, Table 12 and Charts 10-13 include data for 23 disciplines in the 4 academic domains. There is a considerable amount of variability among fields in the Natural Sciences, with Physics having an older faculty on the average and a larger percentage of professors expected to retire in the next decade (especially when compared to Geology and Math/Computer Science). There is considerably less variability in mean age and proportion of faculty over 55 in the Humanities disciplines, while among the Social Sciences and Other disciplines, Education and the Health Professions have relatively older faculties and potentially more retirements in the short-term than other fields, especially the "young" Business Administration and Economics departments.

E. Faculty Hiring Needs Relative to Enrollment Projections: The annual growth rate of 0.86% in the model above is based on estimates provided by the private institutions participating in this study, primarily liberal arts colleges ranging from slightly to very highly selective. It seems fair to assume that growth in faculty size at these colleges and universities will be only partially linked to the projected rebound in national higher education enrollments in the mid to late 1990's, since enrollments at the types of institutions in this sample have historically not fluctuated in response to demographic shifts as much as those at public institutions. The relationship between student enrollments and faculty hiring needs may strongly influence the growth rate at other types of institutions, however, so it was re-examined here (see McGuire and Price, 1989, for an earlier discussion of this issue). The results, presented in Charts 14 and 15, are consistent with those in last year's study and confirm that hiring needs at the modeled growth rate closely parallel high school graduation and consequently higher education enrollment projections. If this growth rate is based on largely

stable enrollment expectations, then it seems fair to assume that other institutions may have even higher faculty growth rates to parallel probable enrollment increases.

F. Comparisons with 1989 F&M model and 1990 Penn State Model: As faculty supply and demand models increase in number and sophistication, it will be important to examine their validity by comparing the original projections of older models with those from presumably more accurate revised models. The present study attempted two such comparisons: the findings described above vs. both the total hiring needs projections of the 1989 Franklin and Marshall study (McGuire & Price, 1989) and the retirement rates of the 1990 Penn State study (Lozier & Dooris, 1990). The results of these comparisons are presented in Charts 16 - 18.

Compared to the present study, the 1989 Franklin and Marshall projections are characterized by both a generally steeper slope and an unusually erratic pattern of steep increases and sharp declines in total hiring needs. There are viable explanations for both trends: the steeper slope was a function of an underestimation of hiring needs in the early years of the 1989 model, which failed to include the retirement of faculty who were over age 65 in 1989, while the erratic pattern was a function of that model's estimation that all retirements would occur at age 65. The 1990 Franklin and Marshall study was based on a more sophisticated cohort survival methodology fueled by actual retirement age distributions, and it incorporated the retirements of faculty over age 65 in 1990. While the 1990 model appears to be the more accurate one, it is interesting to note the general agreement of trends in both studies using only partially (i.e., less than 40%) overlapping samples. This was particularly true when the more recent model's data for the years 2006 - 2010 were included: the fact that significant increases in hiring needs are projected to occur later in the 1990 study produced a steeper linear trend when these years were included, though still not quite to the extent of the 1989 study.

Similarly, retirement rates from the 1990 Penn State model were compared to those from the present study. Because of diffferent sample sizes and populations sampled, the raw data from the two studies were not directly comparable; however, the use of standard scores afforded the opportunity to compare their relative trends. Results indicated initially higher retirement rates for the Franklin and Marshall data, though the Penn State projections had a steeper slope and exceeded the F&M ones in 1994 (or 1993 for the F&M retirement data when not adjusted for pre-retirement separations). The difference between the models is due to a projected dip in retirement rates in the F&M model between 1991 and 1995, though this dip is less pronounced in the non-adjusted model. This differecne may be due to sampling error, or to different retirement age distributions/probability matrices in the two studies. It is also of

interest that the Penn State model projected an earlier (1989-1991) and slightly less sustained dip in retirements. Around the year 2000 the different trend lines converge and project approximately the same rate of retirement through 2003 (the last year in the Penn State study). There is some indication that the models diverge after 2002, though additional data are needed to confirm this trend.

G. Results of Department Chairs and Senior Surveys: To complement the quantitative data presented above, a qualitative survey of the faculty labor market experiences and perceptions of department chairs at Franklin and Marshall College was conducted in the Spring of 1990. In addition, a question was included on the 1990 Senior Survey at Franklin and Marshall to find out how many graduating seniors had considered a career as a college professor (and if not, why not).

The results of the Department Chairs survey, completed by 12 individuals, indicated first of all that recent applicant pools have been of adequate to excellent size and quality in the Humanities and Natural Sciences, though somewhat smaller and weaker than desirable in some of the Social Sciences. The vast majority of recent applicants at Franklin and Marshall have been Ph.D. or terminal degree recipients directly from graduate programs; only 4 of 12 departments reported applicants from other institutions' faculties, and only 2 of 12 reported applicants from outside of academe. Overall these results provide a 1990 baseline against which future faculty supply difficulties might be measured, though for the most part they do not indicate current problems (see El-Khawas, 1990, for a more comprehensive look at, and different findings on, this issue).

Quantitative issues aside, the department chairs identified the following qualitative problems with the current faculty labor market:

- lack of teaching experience among new Ph.D.'s applying for faculty positions;
- slow Ph.D. completion rates as a function of a poor job market;
- less interest in graduate school among undergraduates as a function of the oversupply of Ph.D.'s in the 1970's and 1980's, of active advising against academic careers by some current faculty, of a climate of anti-intellectualism on many campuses, of poor undergraduate preparation, of students' desire to start careers early rather than delay such "gratification" until after graduate school, and of low faculty salaries in an era of materialistic values;
- non-competitiveness of "lost generation" scholars who have been out of the academic mainstream too long to have a good chance for publication and eventual tenure;
- unattractiveness of visiting or non-tenure track positions to applicants;

- inappropriateness of potential applicants from outside of academe due to insufficient theoretical research backgrounds (i.e., they may be good teachers but would constitute a scholarly underclass within the larger faculty culture) or to their unwillingness to accept a lower salary to enter academe;
- good quality of applicants overall but a shallow pool of truly superlative candidates;
- an implicit "requirement" of a post-doctoral appointment in some fields; and
- the inadequacy, from the perspective of a societal labor market, of hiring faculty from outside of academe since they would still need to be replaced in their former positions.

In addition to these perceived problems with the faculty labor market, respondents also offered the following solutions, strategies, or positive outlooks:

- departments need to conduct earlier searches and advertisements, and to consider the option of "stockpiling" faculty while they are available but before they actually needed (a practice also known as "opportunity hiring");
- the lack of interest in graduate school among undergraduates has begun to reverse itself in the past few years;
- there is already be a "latent" supply of qualified applicants who will re-surface in response to the forthcoming wave of faculty retirements;
- increased grant funding of graduate education, higher faculty salaries and start-up funds, the recent "soft" job market in law, a more pro-intellectual atmosphere on college campuses, and active encouragement of undergraduates at the individual or departmental level, will help to recruit students into doctoral programs;
- reductions in teaching loads and administrative or service loads will confer a competitive advantage to an institution in recruiting faculty;
- improvements in elementary and secondary education will eventually supply more qualified and motivated candidates for graduate school; and
- more active recruitment of qualified mid-career transfers from industry would be helpful in some fields.

In light of these comments by selected faculty, it is interesting to note that 40% of the Class of 1990 at Franklin and Marshall indicated that they had considered an eventual career as a college professor. Among those who have not considered or would not consider such a career, the most commonly cited reasons included lack of interest and lack of confidence in their skills. Relatively few students cited low pay, need for a doctorate, heavy workloads, and pressure to publish and to achieve tenure as reasons for not considering a career in academe, although it is unclear whether the latter concerns may in fact be imbedded in "lack of interest" responses.

Discussion

The findings of the present study include information on the nature, extent, timing, and areas of impact for projected increases in demand for higher education faculty over the next 20 years. They also include information on demographic characteristics of current faculty, and on the sources of new faculty hires and the retention of faculty separators. The major findings are summarized in the sections below, and include discussion of strategies for preventing shortages of qualified faculty, future research needs, and related issues.

Faculty Demand: The rate of faculty retirements is projected to increase significantly over the next 20 years, with the largest wave of retirements projected to occur from 1999 through the first decade of the next century. The Natural Sciences will experience a steady increase in faculty retirements and hiring needs for the next 15 years, while the Humanities and especially the Social Sciences will experience fewer retirements and smaller increases in hiring needs for the next decade but steep increases in retirements and new hires after the year 2000.

Academic disciplines with relatively large increases in retirement rates in the 1990's include Physics, Education, Music, and the Health Professions. Disciplines with relatively large increases in retirement rates in the following decade include History, the Health Professions, and Biology. Disciplines with relatively young faculties include Business Administration, Economics, Psychology, Physical Education, Math and Computer Science, and Engineering. It should be noted that the same average retirement probabilities were applied to all disciplines to generate these projections, when in fact some disciplines may have higher mean retirement ages than others, and that many of the "younger" disciplines typically experience intense competition with non-academic employment sectors for both new and established Ph.D.'s.

Faculty Supply: Even at private four-year liberal arts and doctoral/research institutions, a surprising number of new full-time instructional faculty are hired from sources other than Ph.D. programs. Only 42% (or 29% if A.B.D.'s are excluded) of new faculty hires in 1989 were traditional "freshly-minted" Ph.D.'s; the majority of faculty were hired away from other institutions' faculties, or were promoted from part-time to full-time status at the hiring institution. This finding underscores two important elements in faculty supply and demand research: the difference between faculty separations from an institution and faculty separations from the profession, and the difference between increases in demand for new faculty and faculty "shortages". Based on this study, the amount of faculty hiring activity will

certainly increase significantly in the years ahead. To the extent that separating faculty are retained in the profession via re-hire at other institutions, however, the net impact on national supply considerations may be sharply attenuated.

Assumptions and Impact of Model Given the sensitivity of most projection models to relatively small changes in the data and assumptions that fuel them, it seems logical to review scenarios under which the projections presented above would not come to pass and under which the aftermath of accurate projections would be least disruptive to institutions of higher education. In other words, what would need to happen for this model to be wrong, and if it's right, what can be done to minimize the impact of large increases in demand for new faculty? Given the facts that this model projects a 39% increase in new faculty hires and a 36% increase in new hires from outside of academe over the next 20 years, that graduate pipeline projections for the same time period are essentially flat, and that recent data (El-Khawas, 1990) suggest that many colleges and universities are already having difficulty filling faculty positions in several fields, the answer to these questions is especially critical for assessing the advisability of, and devising strategies for, revisions in faculty training and/or hiring practices.

Briefly, the model is sensitive to changes in the distribution of age at retirement, rates of non-retirement separation and promotion, net growth in faculty size (including non-replacement of departing faculty), and rate of rehiring of separators by other institutions. A recent study by Lozier and Dooris (1990) suggests that retirement age distributions are relatively stable and will probably not be much affected by changes in mandatory retirement laws or, from this author's viewpoint, other foreseeable environmental changes. Lozier and Dooris found that type of retirement plan was an important correlate of retirement age, and if a tendency develops for institutions to switch to defined contribution retirement plans lacking a built-in early retirement incentive, the retirement rate over the next 20 years might actually be somewhat lower than projected. More research is needed on this potentially crucial topic.

Rates of non-retirement separation and promotion are determined largely by active and passive academic personnel policies: if tenure and promotion standards are relaxed and successful faculty are more richly rewarded in the future, there may be greater retention of continuing faculty and more rapid promotion to higher (i.e., low-separation) ranks. In the absence of data to suggest otherwise, the separation and promotion rates in the model above appear reasonable; however, longitudinal data collection will be needed to monitor rate changes in the future.

Actual growth in total faculty size will almost certainly be larger than projected in the years ahead at some institutions, while in a few cases faculty size will probably decrease. Growth may be linked to enrollment increases or quality/equity concerns, and both will probably continue to drive up the size of the national professoriate. Regional enrollment declines and financial exigiency will trigger faculty decreases at some institutions, though it is unclear how many colleges and universities will be effected in the next decade if "efficiency" becomes an administrative battle cry. Finally, rate of rehiring separators has an as-yet unspecified upper limit due to retirements, voluntary movement to non-academic sectors, and the unacceptability of some candidates for re-hire. It may also fluctuate from year to year and institution to institution, depending upon incentives for remaining in academe and changes in hiring standards (e.g., in the future it may be easier to get re-hired elsewhere after failing a tenure review). As is the case with many of the indices in this study, further research is needed to validate initial estimates.

In terms of generalizing to the national professoriate, liberal arts colleges are overrepresented while private universities and all types of public institutions are underrepresented or not represented at all in the present sample. It is unclear to what extent the experiences of other types of institutions diverge from the model parameters in this study. One might argue that differences would be most likely in the major research universities and community colleges, given the divergent missions and labor markets for these types of institutions. On the other hand, one might argue that this study's sample represents the "middle ground" of American higher education, and therefore that it may accurately simulate the central tendencies of the national professoriate. Again, further research of a more comprehensive and integrative nature is needed.

Nature of the Faculty The analyses above revealed marked differences in the age, gender, ethnicity, and academic rank distributions of faculty across disciplines. Appointment year distributions illustrate both the historical hiring trends that will contribute to the increase in faculty retirements beginning at the end of this decade, and the increasing diversification of the professoriate that has begun in earnest through the hiring of women and minorities over the past decade. The next 20 years should witness even more opportunities for diversification because of the increase in needed new faculty hires, though projections of only modest numbers of minority students entering the graduate pipeline suggest the need for more aggressive hiring of minority faculty from alternative sources.

The model also suggests a decline in the proportion of full and associate professors in the years ahead, though the evolution of hiring and promotion policies will almost certainly prevent this erosion from occuring as projected. As noted above, it will be important to monitor actual hiring and promotion practices, and consequently shifts in academic rank distributions, since they significantly alter the rate of non-retirement separation and thus total demand for new faculty.

Conclusions The overall impression left by the findings of this study is one of both hope and caution. The fact that projected faculty demand increases are smaller than in previous models, and that significant numbers of recent full-time faculty were hired from non-graduate-program labor pools, suggest that a shortage of faculty may be averted in most fields and at most institutions. The combination of increased demand for faculty within and beyond academe in the years ahead, on the other hand, combined with flat graduate supply projections and current hiring difficulties in some fields/institutions, suggest that the next twenty years may be highly competitive and differentiating ones in American higher education. High enrollment growth will almost certainly exacerbate the need for expanded faculties in some states and institutions, and it seems likely that colleges and universities with the resources to succeed in traditional labor markets or the savvy to exploit less traditional sources of new faculty will prosper to a greater degree than poorer, more isolated institutions.

Another key to preventing a critical faculty supply-demand differential is to curtail demand caused by the need to replace separations. Delayed or phased retirement programs are already being offered in some places; incentives and professional development programs are being offered to retain faculty who might leave an institution for other reasons. A general enhancement of the profession would be expected to produce the dual benefits of retaining experienced scholars and recruiting promising scholars into the graduate pipeline and then into faculty ranks upon completion of doctorate. These strategies might be expected to produce a new faculty of sufficient size and quality to ensure a stable and productive professoriate in the 21st century.

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TABLE 6

Faculty Loss and Demand by Rank, All Departments, Positive Growth

	Full Professors					Associates					Assistants				All Ranks		
Year (Fall)	Total	# Retiring	Other Loss	Total Loss	Promotions In	Total	# Retiring	Other Loss	Total Loss	Promotions In	Total	# Retiring	Other Loss	Total Loss	Net loss	New hires	Total Faculty
1990	3,169	133	41	174	168	2,205	20	221	241	178	2,543	6	415	420	490	558	7,917
1991	3,163	135	41	176	163	2,141	23	215	238	187	2,681	4	437	441	505	573	7,985
1992	3,149	127	41	167	159	2,091	24	210	233	197	2,813	5	459	463	508	577	8,054
1993	3,141	121	41	161	156	2,054	24	206	231	205	2,927	4	477	481	512	582	8,123
1994	3,136	116	40	156	154	2,028	23	204	227	212	3,028	4	494	497	514	584	8,193
1995	3,135	114	40	154	153	2,013	24	202	226	218	3,115	4	508	511	521	592	8,263
1996	3,134	114	40	155	153	2,005	26	201	227	223	3,196	3	521	524	530	602	8,334
1997	3,131	114	40	154	152	2,001	26	201	227	229	3,274	8	534	542	541	614	8,406
1998	3,129	112	40	153	152	2,003	26	201	227	234	3,346	9	545	554	548	621	8,478
1999	3,129	112	40	153	153	2,010	28	202	229	239	3,412	10	556	566	557	631	8,551
2000	3,130	114	40	154	154	2,019	29	203	232	243	3,476	13	567	579	569	643	8,625
2001	3,129	113	40	153	154	2,030	43	204	247	247	3,540	14	577	591	590	665	8,699
2002	3,130	111	40	152	155	2,030	48	204	252	253	3,613	15	589	604	600	676	8,774
2003	3,133	114	40	154	155	2,031	54	204	257	258	3,685	17	601	617	617	693	8,849
2004	3,133	111	40	151	155	2,031	59	204	263	263	3,761	20	613	633	629	706	8,925
2005	3,137	106	40	146	155	2,031	64	204	268	268	3,834	22	625	647	639	717	9,002
2006	3,145	100	41	140	155	2,031	68	204	271	273	3,904	24	636	660	644	723	9,080
2007	3,159	100	41	141	155	2,032	76	204	280	277	3,966	35	646	682	671	750	9,158
2008	3,173	95	41	136	154	2,029	86	204	290	282	4,034	42	658	699	689	768	9,236
2009	3,191	83	41	124	154	2,022	89	203	292	287	4,103	50	669	719	695	775	9,316
2010	3,221	74	42	115	153	2,016	88	202	291	291	4,159	56	678	734	696	777	9,396

TABLE 7

Faculty Turnover, All Departments, Positive Growth

Year (Fall)	Total Retirees	Net loss	New hires	# Retiring as % of: Net loss	# Retiring as % of: All faculty	Loss as % of All faculty	New Hires as % of All faculty	Full Profs as % of Faculty	Associates as % of Faculty	Assistants as % of Faculty	Separators for rehire # Available	Separators for rehire % of New Hires	New Faculty Needed
1990	159	490	558	32.5%	2.0%	6.2%	7.1%	40.0%	27.9%	32.1%	188	33.7%	370
1991	162	505	573	32.1%	2.0%	6.3%	7.2%	39.6%	26.8%	33.6%	197	34.4%	376
1992	155	508	577	30.5%	1.9%	6.3%	7.2%	39.1%	26.0%	34.9%	204	35.3%	374
1993	149	512	582	29.1%	1.8%	6.3%	7.2%	38.7%	25.3%	36.0%	209	35.9%	373
1994	142	514	584	27.7%	1.7%	6.3%	7.1%	38.3%	24.8%	37.0%	214	36.6%	371
1995	142	521	592	27.2%	1.7%	6.3%	7.2%	37.9%	24.4%	37.7%	218	36.8%	374
1996	143	530	602	27.0%	1.7%	6.4%	7.2%	37.6%	24.1%	38.3%	222	37.0%	379
1997	147	541	614	27.2%	1.8%	6.4%	7.3%	37.2%	23.8%	38.9%	226	36.9%	387
1998	147	548	621	26.9%	1.7%	6.5%	7.3%	36.9%	23.6%	39.5%	230	37.1%	390
1999	150	557	631	27.0%	1.8%	6.5%	7.4%	36.6%	23.5%	39.9%	234	37.1%	397
2000	156	569	643	27.4%	1.8%	6.6%	7.5%	36.3%	23.4%	40.3%	238	36.9%	406
2001	171	590	665	28.9%	2.0%	6.8%	7.6%	36.0%	23.3%	40.7%	241	36.3%	423
2002	174	600	676	29.0%	2.0%	6.8%	7.7%	35.7%	23.1%	41.2%	245	36.3%	430
2003	184	617	693	29.8%	2.1%	7.0%	7.8%	35.4%	23.0%	41.6%	249	36.0%	444
2004	189	629	706	30.1%	2.1%	7.1%	7.9%	35.1%	22.8%	42.1%	253	35.9%	453
2005	193	639	717	30.1%	2.1%	7.1%	8.0%	34.8%	22.6%	42.6%	257	35.9%	459
2006	191	644	723	29.7%	2.1%	7.1%	8.0%	34.6%	22.4%	43.0%	261	36.1%	462
2007	212	671	750	31.6%	2.3%	7.3%	8.2%	34.5%	22.2%	43.3%	265	35.3%	485
2008	223	689	768	32.3%	2.4%	7.5%	8.3%	34.4%	22.0%	43.7%	269	35.0%	499
2009	222	695	775	32.0%	2.4%	7.5%	8.3%	34.3%	21.7%	44.0%	272	35.1%	503
2010	218	696	777	31.4%	2.3%	7.4%	8.3%	34.3%	21.5%	44.3%	275	35.4%	502
Change, 1990-2010	**37.24%**	**41.97%**	**39.13%**								**46.20%**		**35.53%**

Assumptions:

0.86% Annual growth rate
56.86% Retention of non-retired separators in professoriate
1.69% Retention of retired separators in professoriate
Number retiring was decremented to remove those who leave faculty ranks for other reasons before reaching retirement age.
1.29% Non-retirement separation rate for full professors
2.43% Non-retirement separation rate for associate professors
9.31% Non-retirement separation rate for assistant professors
7.61% Promotion rate, associate-to-full
6.99% Promotion rate, assistant-to-associate

TABLE 8

Faculty Turnover, All Departments, Zero Growth

Year (Fall)	Total Retirees	Net loss	New hires	# Retiring as % of: Net loss	# Retiring as % of: All faculty	Loss as % of All faculty	New Hires as % of All faculty	Full Profs as % of Faculty	Associates as % of Faculty	Assistants as % of Faculty	Separators for rehire # Available	Separators for rehire % of New Hires	New Faculty Needed
1990	159	490	558	32.5%	2.0%	6.2%	7.1%	40.0%	27.9%	32.1%	188	33.7%	370
1991	162	505	573	32.1%	2.0%	6.3%	7.2%	39.6%	26.8%	33.6%	197	34.4%	376
1992	155	508	577	30.5%	1.9%	6.3%	7.2%	39.1%	26.0%	34.9%	204	35.3%	374
1993	149	512	582	29.1%	1.8%	6.3%	7.2%	38.7%	25.3%	36.0%	209	35.9%	373
1994	142	514	584	27.7%	1.7%	6.3%	7.1%	38.3%	24.8%	37.0%	214	36.6%	371
1995	142	521	592	27.2%	1.7%	6.3%	7.2%	37.9%	24.4%	37.7%	218	36.8%	374
1996	143	530	602	27.0%	1.7%	6.4%	7.2%	37.6%	24.1%	38.3%	222	37.0%	379
1997	147	541	614	27.2%	1.8%	6.4%	7.3%	37.2%	23.8%	38.9%	226	36.9%	387
1998	147	548	621	26.9%	1.7%	6.5%	7.3%	36.9%	23.6%	39.5%	230	37.1%	390
1999	150	557	631	27.0%	1.8%	6.5%	7.4%	36.6%	23.5%	39.9%	234	37.1%	397
2000	156	569	643	27.4%	1.8%	6.6%	7.5%	36.3%	23.4%	40.3%	238	36.9%	406
2001	171	590	665	28.9%	2.0%	6.8%	7.6%	36.0%	23.3%	40.7%	241	36.3%	423
2002	174	600	676	29.0%	2.0%	6.8%	7.7%	35.7%	23.1%	41.2%	245	36.3%	430
2003	184	617	693	29.8%	2.1%	7.0%	7.8%	35.4%	23.0%	41.6%	249	36.0%	444
2004	189	629	706	30.1%	2.1%	7.1%	7.9%	35.1%	22.8%	42.1%	253	35.9%	453
2005	193	639	717	30.1%	2.1%	7.1%	8.0%	34.8%	22.6%	42.6%	257	35.9%	459
2006	191	644	723	29.7%	2.1%	7.1%	8.0%	34.6%	22.4%	43.0%	261	36.1%	462
2007	212	671	750	31.6%	2.3%	7.3%	8.2%	34.5%	22.2%	43.3%	265	35.3%	485
2008	223	689	768	32.3%	2.4%	7.5%	8.3%	34.4%	22.0%	43.7%	269	35.0%	499
2009	222	695	775	32.0%	2.4%	7.5%	8.3%	34.3%	21.7%	44.0%	272	35.1%	503
2010	218	696	777	31.4%	2.3%	7.4%	8.3%	34.3%	21.5%	44.3%	275	35.4%	502
Change, 1990-2010	**37.24%**	**41.97%**	**39.13%**								**46.20%**		**35.53%**

Assumptions: **0% Annual growth rate**
56.86% Retention of non-retired separators in professoriate
1.69% Retention of retired separators in professoriate
Number retiring was decremented to remove those who leave faculty ranks for other reasons before reaching retirement age.

1.29% Non-retirement separation rate for full professors
2.43% Non-retirement separation rate for associate professors
9.31% Non-retirement separation rate for assistant professors
7.61% Promotion rate, associate-to-full
6.99% Promotion rate, assistant-to-associate

TABLE 9

Faculty Turnover, Natural Sciences, Positive Growth

Year (Fall)	Total Retirees	Net loss	New hires	# Retiring as % of: Net loss	# Retiring as % of: All faculty	Loss as % of All faculty	New Hires as % of All faculty	Full Profs as % of Faculty	Associates as % of Faculty	Assistants as % of Faculty	Separators for rehire # Available	Separators for rehire % of New Hires	New Faculty Needed
1990	32	98	113	32.4%	1.8%	5.7%	6.5%	45.7%	26.2%	28.1%	38	33.8%	75
1991	32	101	116	31.5%	1.8%	5.8%	6.7%	45.0%	25.2%	29.8%	40	34.4%	76
1992	34	106	121	32.0%	1.9%	6.0%	6.9%	44.3%	24.4%	31.3%	41	34.3%	79
1993	33	107	123	30.7%	1.9%	6.0%	6.9%	43.5%	23.7%	32.8%	43	35.0%	80
1994	32	109	124	29.7%	1.8%	6.1%	7.0%	42.8%	23.2%	34.1%	44	35.5%	80
1995	32	111	127	29.0%	1.8%	6.2%	7.0%	42.1%	22.8%	35.1%	45	35.9%	81
1996	32	113	129	28.7%	1.8%	6.2%	7.1%	41.3%	22.6%	36.1%	47	36.1%	82
1997	35	118	134	29.9%	1.9%	6.4%	7.3%	40.6%	22.4%	37.0%	48	35.6%	86
1998	36	121	137	29.7%	1.9%	6.5%	7.4%	39.8%	22.4%	37.9%	49	35.8%	88
1999	36	123	139	29.4%	1.9%	6.6%	7.4%	39.0%	22.3%	38.7%	50	35.9%	89
2000	37	126	142	29.7%	2.0%	6.7%	7.6%	38.2%	22.4%	39.4%	51	35.9%	91
2001	39	130	146	30.2%	2.1%	6.8%	7.7%	37.4%	22.5%	40.1%	52	35.7%	94
2002	41	133	150	30.6%	2.1%	6.9%	7.8%	36.7%	22.5%	40.8%	53	35.6%	96
2003	42	137	153	31.0%	2.2%	7.1%	7.9%	36.0%	22.5%	41.5%	54	35.4%	99
2004	42	138	155	30.5%	2.2%	7.1%	8.0%	35.3%	22.5%	42.2%	55	35.7%	100
2005	44	142	159	31.1%	2.2%	7.2%	8.1%	34.8%	22.5%	42.7%	56	35.5%	102
2006	40	140	157	28.8%	2.0%	7.0%	7.9%	34.3%	22.4%	43.3%	57	36.5%	100
2007	45	146	163	30.8%	2.2%	7.3%	8.1%	34.0%	22.4%	43.6%	58	35.7%	105
2008	47	149	167	31.4%	2.3%	7.4%	8.3%	33.7%	22.3%	44.0%	59	35.4%	108
2009	45	149	166	30.2%	2.2%	7.3%	8.2%	33.5%	22.1%	44.4%	60	36.0%	106
2010	43	148	166	29.2%	2.1%	7.2%	8.1%	33.5%	22.0%	44.6%	60	36.4%	106
Change, 1990-2010	35.83%	50.78%	46.57%								57.65%		40.90%

Assumptions: 0.86% Annual growth rate
All other assumptions are identical to those in the All Departments Tables

Disciplines: Biological Sciences, Chemistry, Geology and Earth Sciences, Physics, Mathematics, Astronomy, Computer Science

TABLE 10

Faculty Turnover, Social Sciences, Positive Growth

Year (Fall)	Total Retirees	Net loss	New hires	# Retiring as % of: Net loss	# Retiring as % of: All faculty	Loss as % of All faculty	New Hires as % of All faculty	Full Profs as % of Faculty	Associates as % of Faculty	Assistants as % of Faculty	Separators for rehire # Available	Separators for rehire % of New Hires	New Faculty Needed
1990	52	165	188	31.4%	1.9%	6.2%	7.1%	39.2%	27.6%	33.2%	65	34.7%	123
1991	52	169	192	31.0%	2.0%	6.3%	7.2%	38.9%	26.7%	34.4%	67	35.0%	125
1992	49	169	193	29.0%	1.8%	6.3%	7.1%	38.5%	25.9%	35.6%	69	35.9%	123
1993	46	169	193	27.2%	1.7%	6.2%	7.1%	38.2%	25.3%	36.6%	71	36.8%	122
1994	43	168	192	25.3%	1.5%	6.1%	7.0%	37.9%	24.8%	37.3%	72	37.6%	120
1995	42	170	194	24.8%	1.5%	6.1%	7.0%	37.7%	24.4%	37.8%	73	37.8%	120
1996	45	174	199	25.6%	1.6%	6.2%	7.1%	37.6%	24.2%	38.3%	75	37.6%	124
1997	44	176	200	25.0%	1.6%	6.2%	7.1%	37.4%	23.9%	38.8%	76	37.8%	124
1998	43	177	201	24.3%	1.5%	6.2%	7.1%	37.2%	23.7%	39.1%	77	38.2%	124
1999	44	179	204	24.5%	1.5%	6.2%	7.1%	37.1%	23.6%	39.4%	78	38.1%	126
2000	47	184	209	25.4%	1.6%	6.3%	7.2%	37.0%	23.4%	39.6%	79	37.7%	130
2001	53	192	217	27.5%	1.8%	6.6%	7.4%	36.8%	23.4%	39.9%	80	36.9%	137
2002	54	195	220	27.7%	1.8%	6.6%	7.5%	36.6%	23.1%	40.3%	81	36.8%	139
2003	58	201	226	28.7%	1.9%	6.8%	7.6%	36.4%	22.9%	40.7%	82	36.4%	144
2004	61	206	232	29.5%	2.0%	6.9%	7.7%	36.2%	22.7%	41.1%	84	36.1%	148
2005	62	210	236	29.7%	2.1%	6.9%	7.8%	36.0%	22.4%	41.6%	85	36.0%	151
2006	64	214	240	30.0%	2.1%	7.0%	7.9%	35.8%	22.2%	42.0%	86	35.9%	154
2007	73	225	252	32.5%	2.4%	7.3%	8.2%	35.5%	22.0%	42.4%	88	34.8%	164
2008	76	231	257	33.0%	2.5%	7.4%	8.3%	35.3%	21.7%	43.0%	89	34.7%	168
2009	77	234	261	32.9%	2.5%	7.5%	8.3%	35.1%	21.4%	43.4%	91	34.7%	170
2010	77	236	263	32.5%	2.4%	7.5%	8.3%	35.1%	21.1%	43.8%	92	34.9%	171
Change, 1990-2010	**48.13%**	**42.81%**	**39.88%**								**40.48%**		**39.55%**

Assumptions: 0.86% Annual growth rate
All other assumptions are identical to those in the All Departments Tables

Disciplines: Anthropology, Sociology, Social Work, Psychology, History, Geography, International Studies, Political Science, Economics, Business Administration, Education

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TABLE 11

Faculty Turnover, Humanities, Positive Growth

Year (Fall)	Total Retirees	Net loss	New hires	# Retiring as % of: Net loss	# Retiring as % of: All faculty	Loss as % of All faculty	New Hires as % of All faculty	Full Profs as % of Faculty	Associates as % of Faculty	Assistants as % of Faculty	Separators for rehire # Available	Separators for rehire % of New Hires	New Faculty Needed
1990	51	159	180	32.2%	2.1%	6.4%	7.3%	36.9%	29.3%	33.9%	62	34.4%	118
1991	53	164	185	32.4%	2.1%	6.6%	7.4%	36.7%	28.1%	35.2%	64	34.5%	121
1992	53	167	189	31.9%	2.1%	6.6%	7.5%	36.3%	27.2%	36.4%	66	34.8%	123
1993	50	167	188	29.7%	1.9%	6.6%	7.4%	35.9%	26.5%	37.6%	67	35.8%	121
1994	49	169	191	29.1%	1.9%	6.6%	7.5%	35.6%	25.9%	38.5%	69	36.1%	122
1995	48	171	193	28.4%	1.9%	6.6%	7.5%	35.3%	25.5%	39.3%	70	36.5%	123
1996	48	172	195	27.6%	1.8%	6.6%	7.5%	35.0%	25.1%	39.9%	72	36.8%	123
1997	49	175	198	27.7%	1.8%	6.7%	7.5%	34.7%	24.8%	40.5%	73	36.8%	125
1998	47	176	199	26.8%	1.8%	6.6%	7.5%	34.5%	24.6%	40.9%	74	37.2%	125
1999	49	180	203	27.4%	1.8%	6.7%	7.6%	34.3%	24.5%	41.2%	75	37.0%	128
2000	50	183	206	27.6%	1.9%	6.8%	7.6%	34.2%	24.3%	41.6%	76	36.9%	130
2001	54	188	212	28.9%	2.0%	6.9%	7.8%	34.0%	24.1%	41.8%	77	36.4%	135
2002	55	191	215	28.9%	2.0%	7.0%	7.8%	33.9%	23.9%	42.2%	78	36.4%	137
2003	58	196	219	29.6%	2.1%	7.1%	7.9%	33.8%	23.6%	42.6%	79	36.1%	140
2004	62	201	225	30.6%	2.2%	7.2%	8.1%	33.8%	23.3%	42.9%	80	35.7%	145
2005	61	203	227	30.1%	2.2%	7.2%	8.1%	33.7%	22.9%	43.4%	82	36.0%	145
2006	61	204	229	29.8%	2.1%	7.2%	8.0%	33.7%	22.6%	43.7%	83	36.1%	146
2007	69	214	238	32.1%	2.4%	7.5%	8.3%	33.8%	22.4%	43.9%	84	35.1%	155
2008	72	219	244	33.0%	2.5%	7.6%	8.4%	33.8%	22.1%	44.2%	85	34.7%	159
2009	73	221	247	32.8%	2.5%	7.6%	8.5%	33.8%	21.7%	44.5%	86	34.8%	161
2010	72	222	247	32.2%	2.4%	7.5%	8.4%	34.0%	21.3%	44.7%	87	35.1%	161
Change, 1990-2010	39.88%	39.89%	37.38%								39.90%		36.06%

Assumptions: 0.86% Annual growth rate
All other assumptions are identical to those in the All Departments Tables

Disciplines: Art, Communication and Performing Arts, English, Music, Philosophy, Religious Studies, Classics, Foreign Languages

TABLE 12

Age, Rank, Gender, and Ethnicity Distributions by Academic Discipline

	N	Mean Age	Age (in years) 55 or older	45-54	44 or younger	% Full Professor	% Assoc Professor	% Asst Professor *	% Female	% Minority
Natural Sciences										
Biology	399	47.3	25.7%	33.7%	40.6%	46.3%	30.7%	23.0%	18.2%	4.0%
Chemistry	312	46.2	26.8%	28.1%	45.1%	49.8%	22.1%	28.1%	15.7%	6.1%
Geology	131	45.3	17.4%	33.3%	49.2%	45.5%	20.5%	34.1%	12.8%	1.6%
Math/Computer Science	576	45.2	20.8%	25.8%	53.4%	37.6%	30.0%	32.3%	13.8%	5.4%
Physics	294	48.3	33.6%	30.2%	36.2%	56.7%	19.8%	23.5%	6.5%	8.4%
TOTAL – Natural Sciences	1,712	46.4	25.0%	29.4%	45.6%	45.7%	26.2%	28.0%	13.8%	5.4%
Humanities										
Foreign Languages	684	47.2	26.3%	32.4%	41.3%	32.7%	28.1%	39.3%	41.9%	14.2%
English	571	47.2	26.4%	31.5%	42.1%	45.2%	24.7%	30.1%	32.3%	4.8%
Music	306	46.6	29.2%	26.8%	44.0%	38.5%	32.9%	28.6%	24.2%	5.7%
Philosophy/Theology	397	47.1	26.7%	28.5%	44.9%	39.7%	29.7%	30.7%	18.1%	5.2%
Art	286	47.1	26.2%	28.6%	45.2%	35.1%	31.0%	33.8%	34.9%	2.6%
Communication Arts/Drama	227	46.3	20.7%	29.6%	49.8%	23.8%	33.5%	42.7%	35.1%	3.7%
TOTAL – Humanities	2,471	47.0	26.2%	30.2%	43.6%	36.9%	29.0%	34.1%	32.2%	7.2%
Social Sciences										
Business Administration	497	43.9	15.0%	27.6%	57.4%	32.1%	27.4%	40.4%	18.2%	10.0%
Economics	378	43.5	17.7%	25.1%	57.3%	31.7%	28.5%	39.8%	16.7%	11.1%
Education	220	48.2	29.3%	30.7%	40.1%	37.8%	28.4%	33.8%	44.9%	4.1%
History	426	48.0	26.6%	37.4%	36.0%	49.0%	24.7%	26.3%	22.3%	7.1%
Political Science	320	45.5	20.6%	30.3%	49.1%	42.3%	23.9%	33.7%	17.3%	7.5%
Psychology	375	45.2	23.0%	22.3%	54.8%	45.5%	23.8%	30.7%	30.2%	5.0%
Sociology/Anthropology	331	46.8	22.7%	33.0%	44.4%	34.7%	36.5%	28.7%	33.6%	6.9%
TOTAL – Social Sciences	2,547	45.7	21.5%	29.4%	49.2%	39.0%	27.4%	33.6%	24.6%	7.7%
Professional/Other										
Engineering	418	45.4	22.7%	25.6%	51.7%	46.4%	23.4%	30.1%	5.8%	17.8%
Law	139	45.6	18.7%	31.0%	50.4%	55.4%	21.6%	23.0%	17.0%	4.3%
Nursing	103	46.7	14.6%	41.7%	43.7%	20.2%	30.3%	49.4%	94.2%	10.8%
Physical Education	160	44.7	22.8%	23.4%	53.7%	19.8%	40.1%	40.1%	36.6%	2.5%
Health Professions (Total)	127	48.2	28.4%	35.5%	36.2%	51.0%	27.8%	21.3%	N/A	N/A
[Veterinary]	62	45.7	21.0%	32.3%	46.8%	49.1%	18.9%	32.1%	N/A	N/A
[Medicine]	32	51.1	31.3%	46.9%	21.9%	51.7%	37.9%	10.3%	N/A	N/A
[Dentistry]	33	49.9	39.4%	30.3%	30.3%	53.8%	34.6%	11.5%	N/A	N/A
TOTAL – Professional/Other	947	45.8	22.0%	29.1%	48.9%	41.0%	27.3%	31.7%	21.5%	10.1%
TOTAL – All Disciplines	**7,677**	**46.3**	**23.8%**	**29.6%**	**46.6%**	**40.1%**	**27.6%**	**32.3%**	**21.6%**	**6.1%**

Note: This table excludes 277 faculty from poorly represented disciplines; the mean age for the total sample N of 7,954 is 46.4 years.

* Includes Instructors

CHART 1

Faculty Age Distribution, N = 7,954

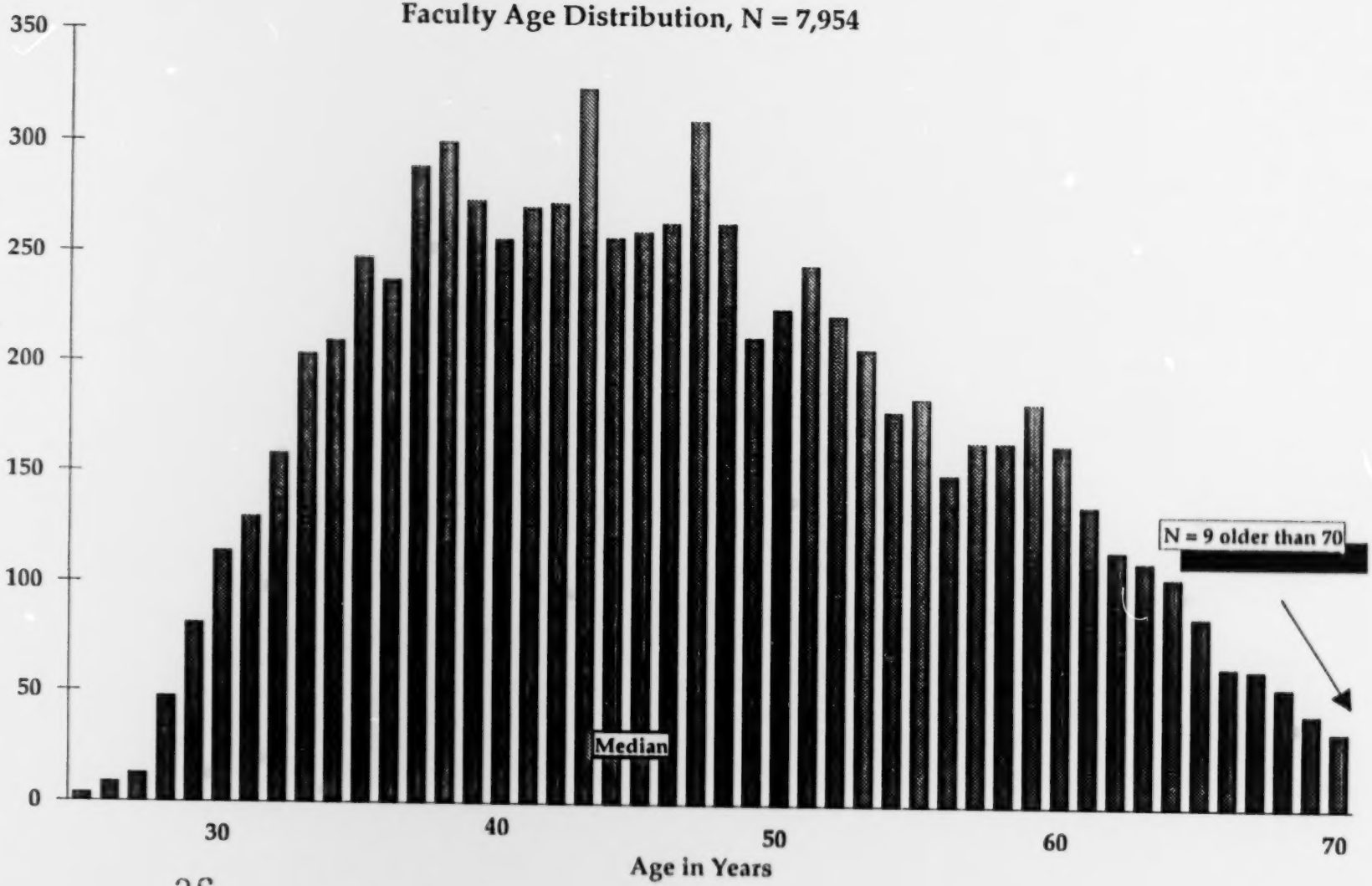

CHART 2

Year of Current Faculty Appointment

N = 8,042

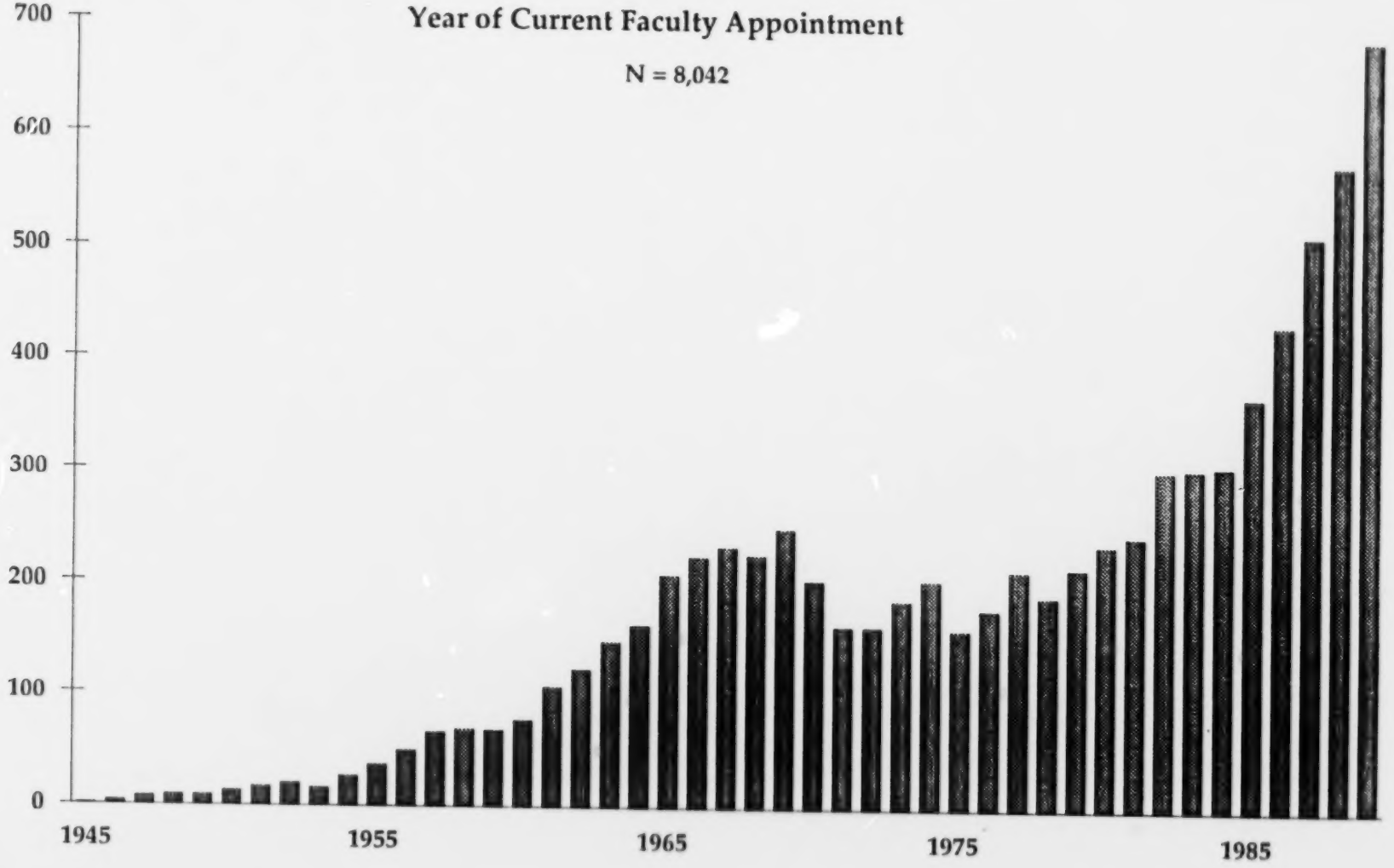

CHART 3

Year of Terminal Degree

N = 3,492

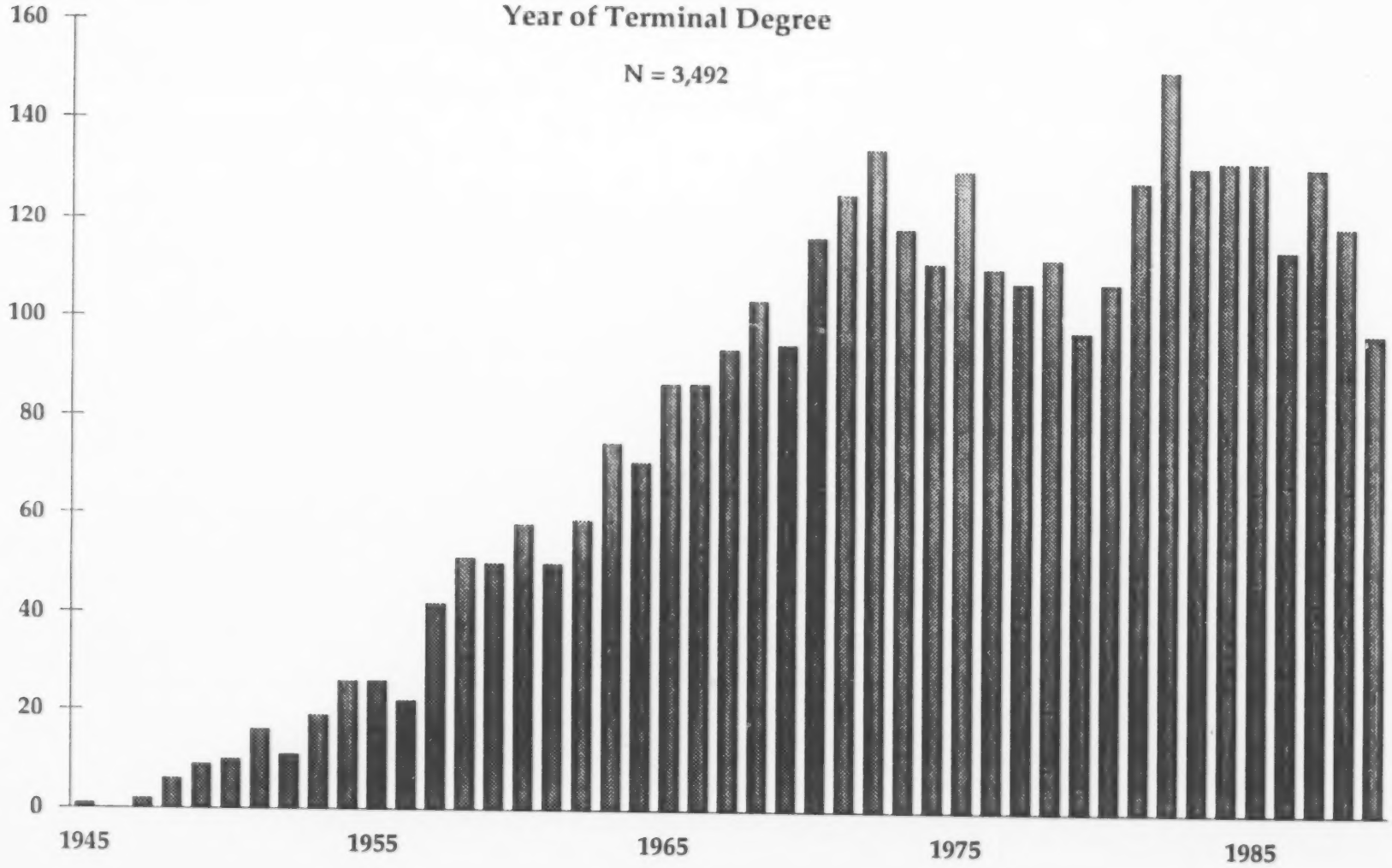

CHART 4

Year of Current Faculty Appointment, by Gender

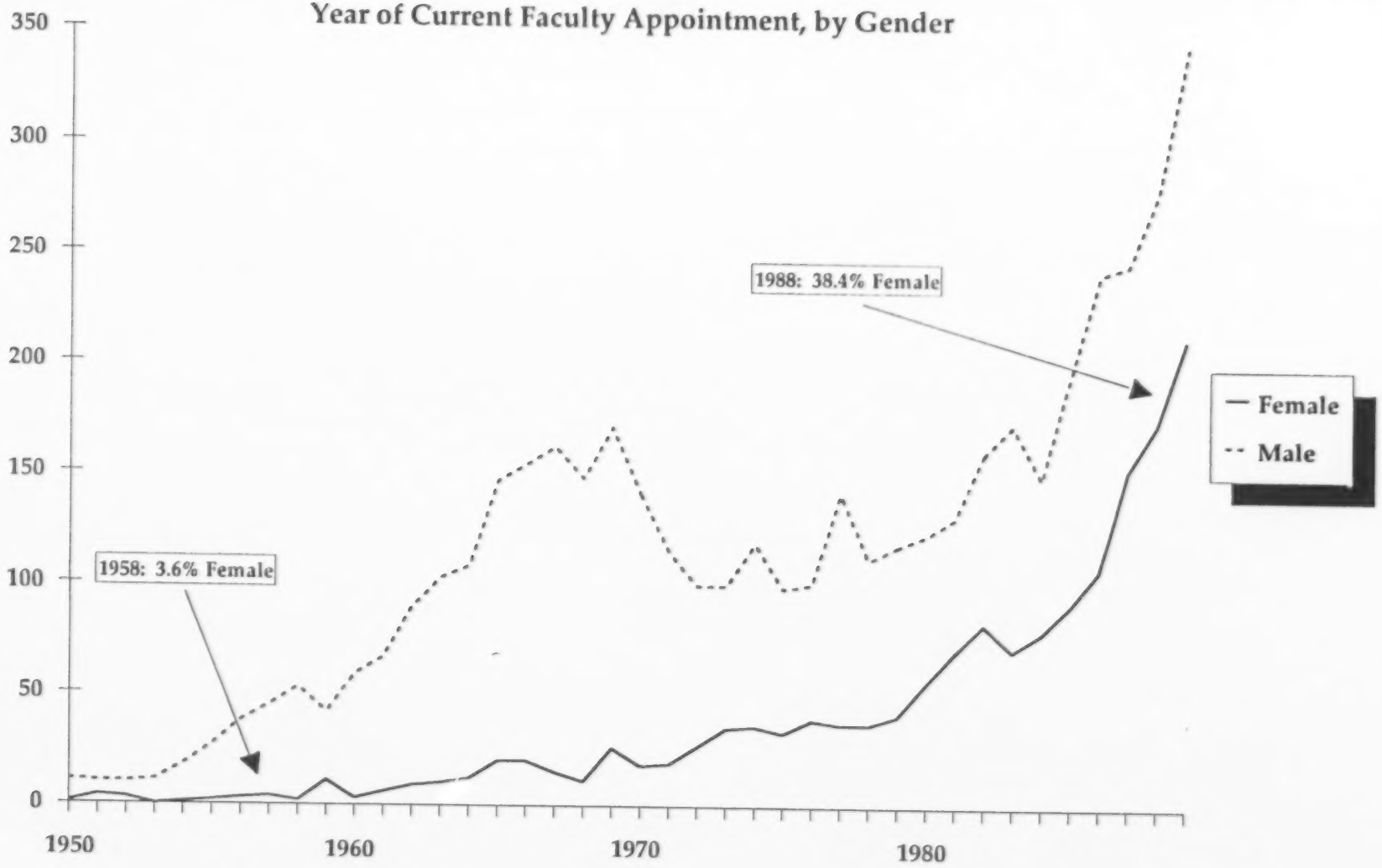

CHART 5
Year of Current Faculty Appointment, by Ethnicity

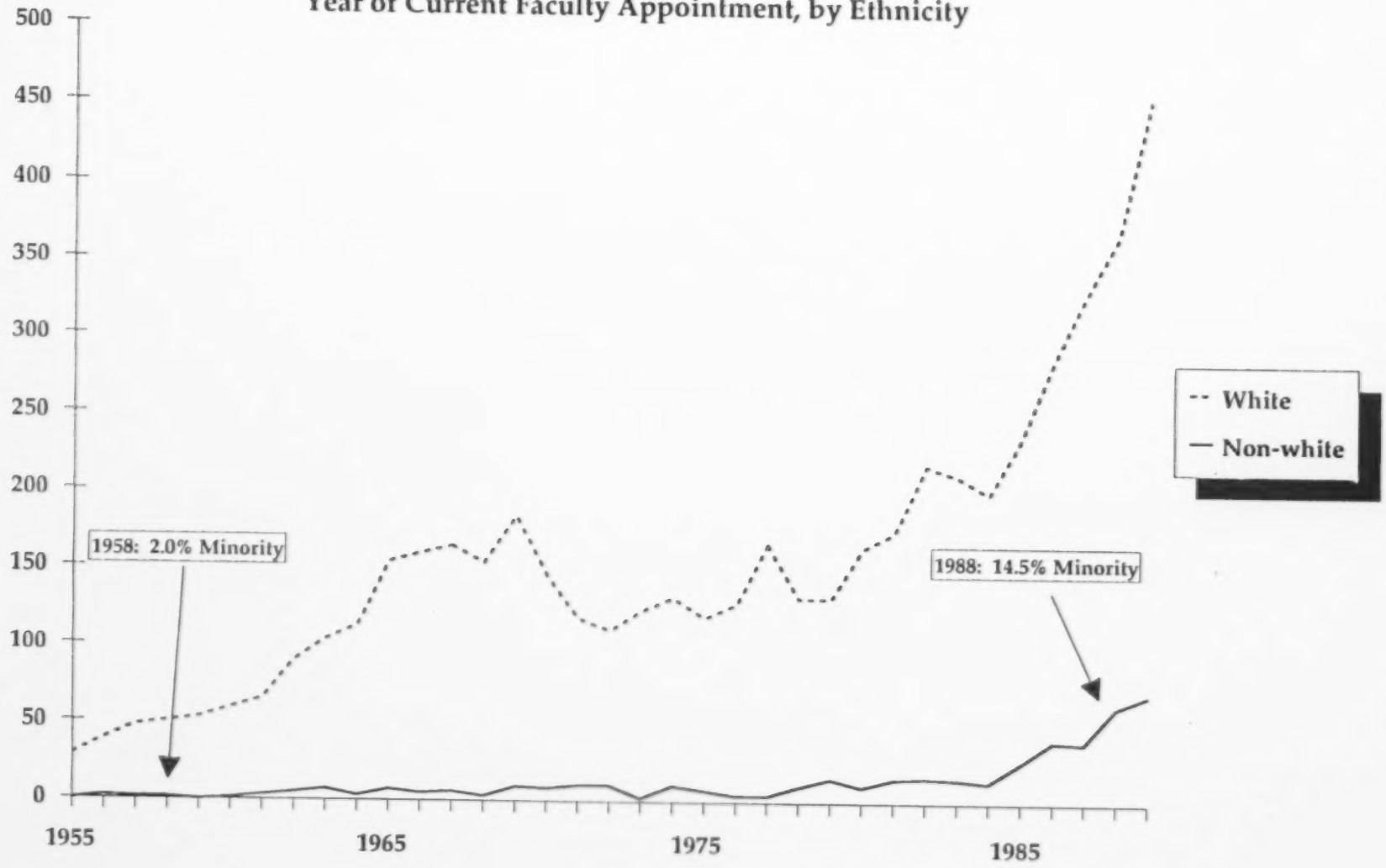

CHART 6

Projected Faculty Retirements, 1990 - 2010

Annual Projections and Linear Trend

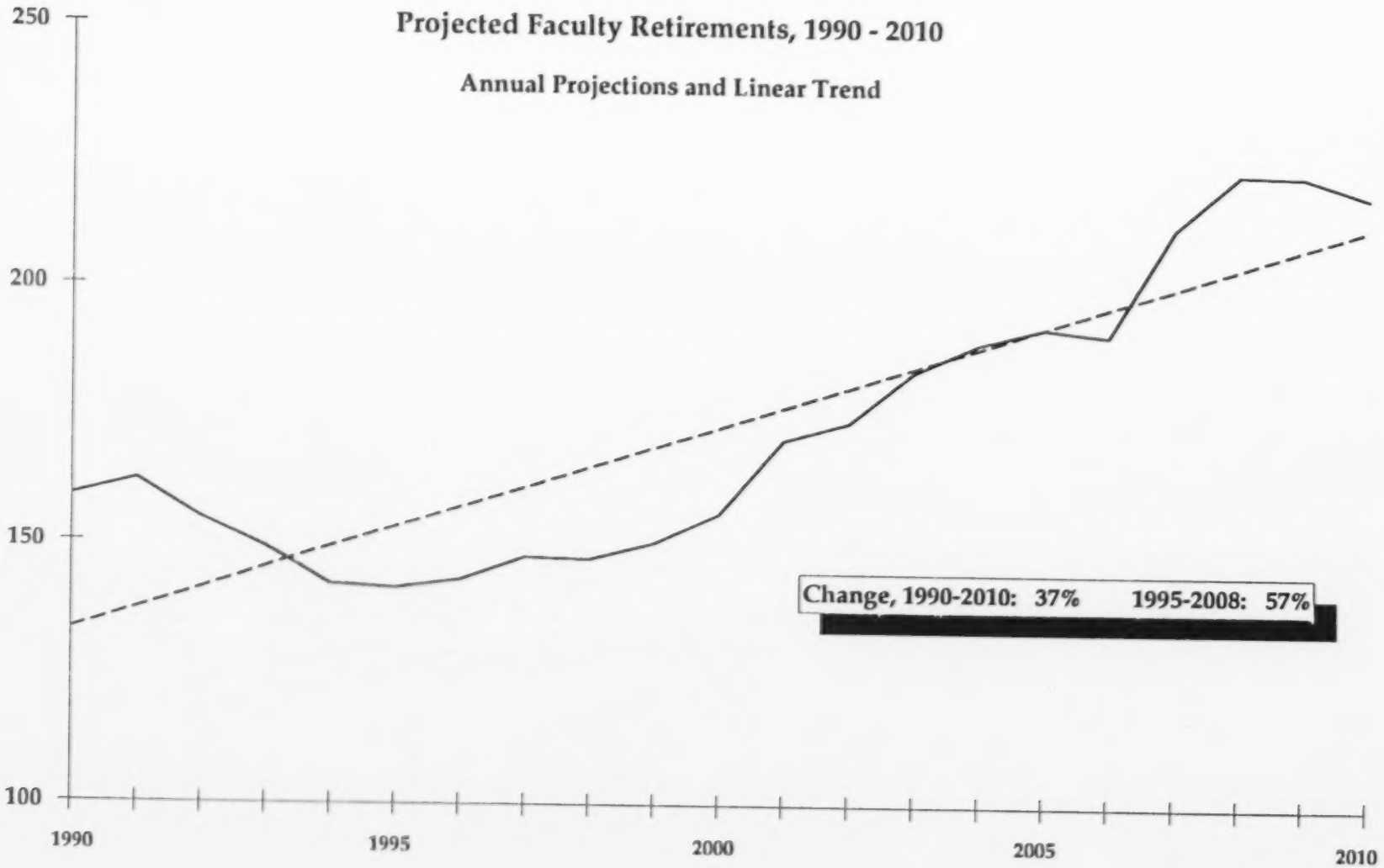

CHART 7

Projected Total Faculty Hiring Needs, 1990 - 2010

Annual Projections and Linear Trend

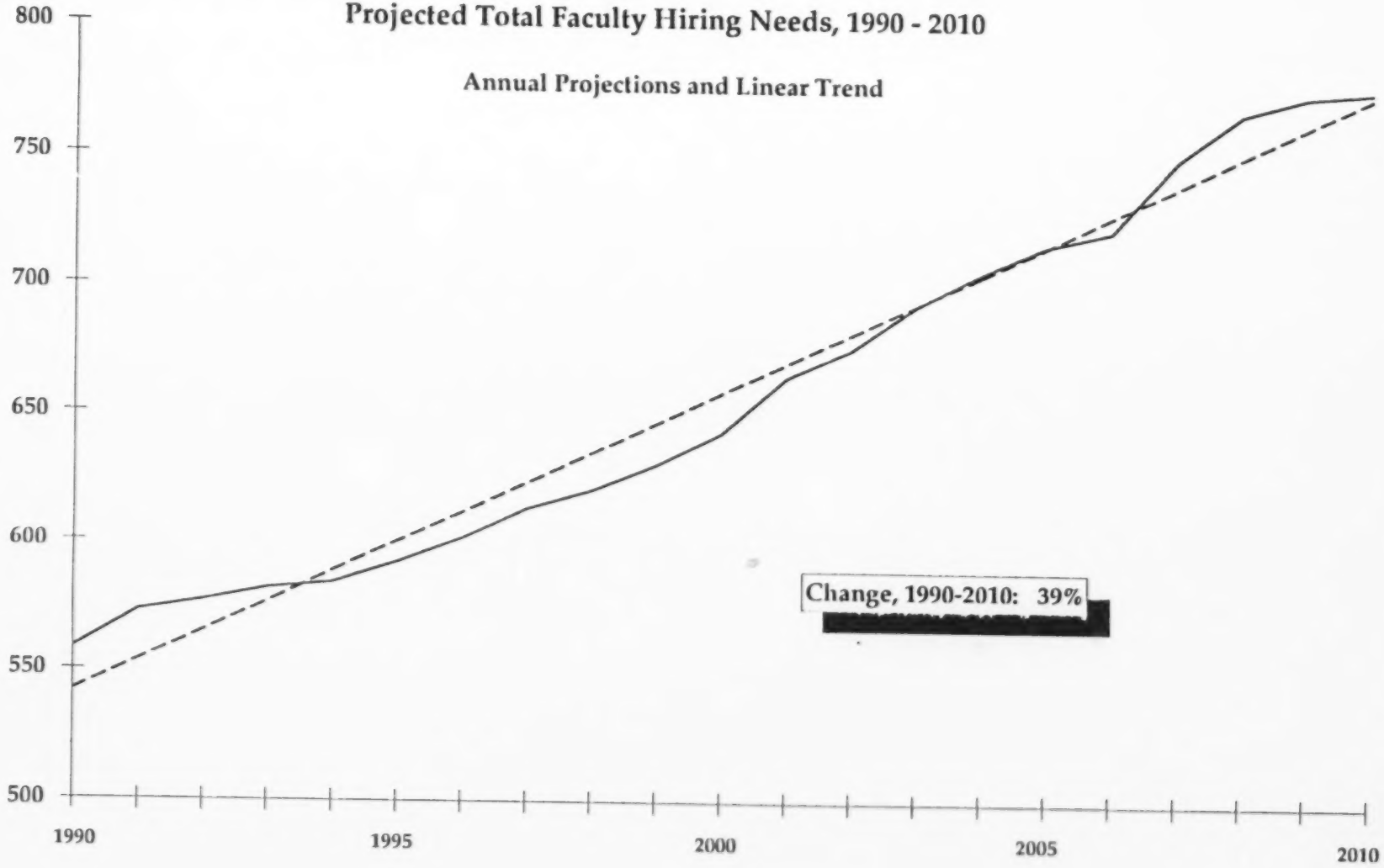

CHART 8

New Hires as a % of All Faculty

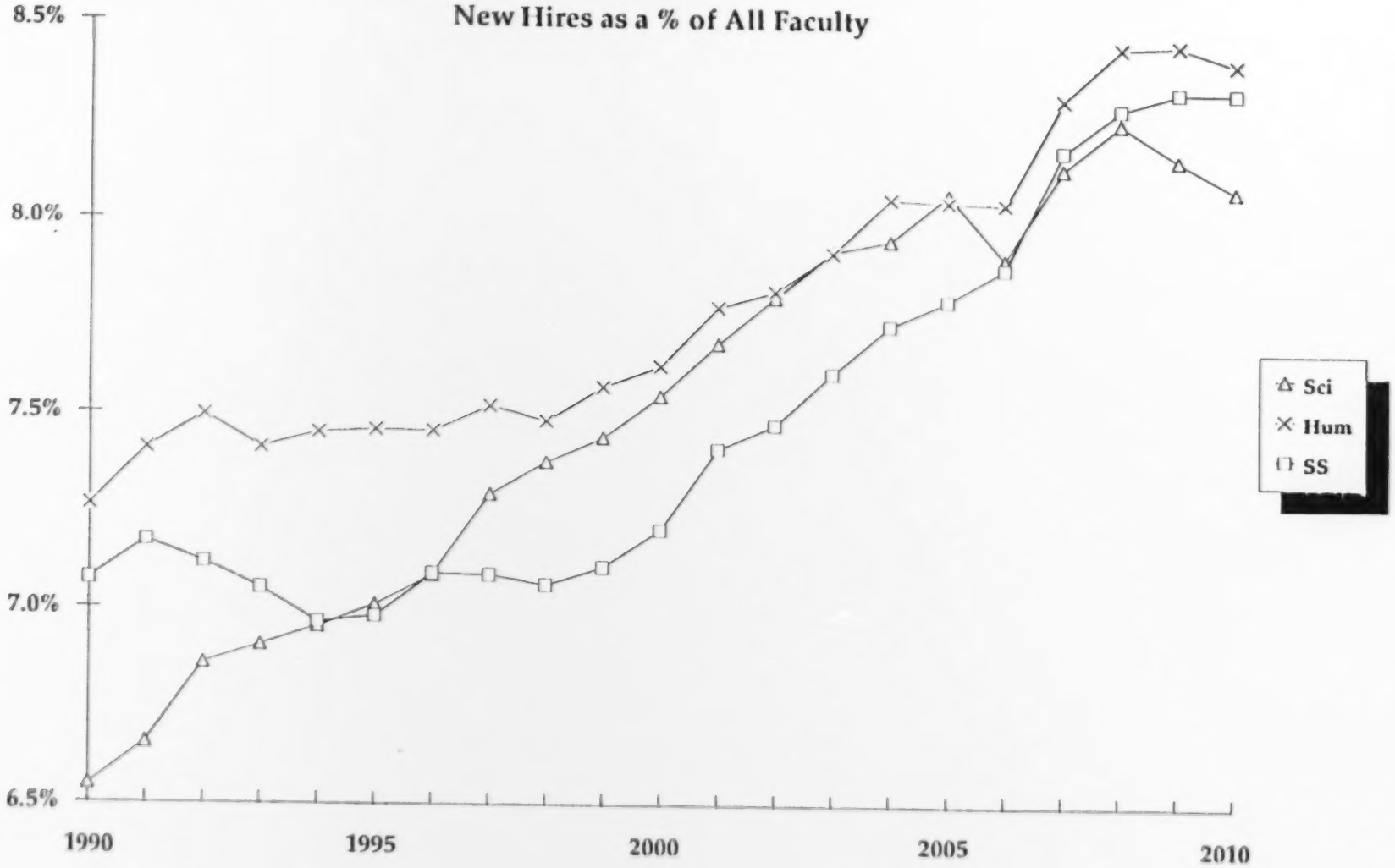

CHART 9

New Hires as a % of All Faculty

(Linear Trends)

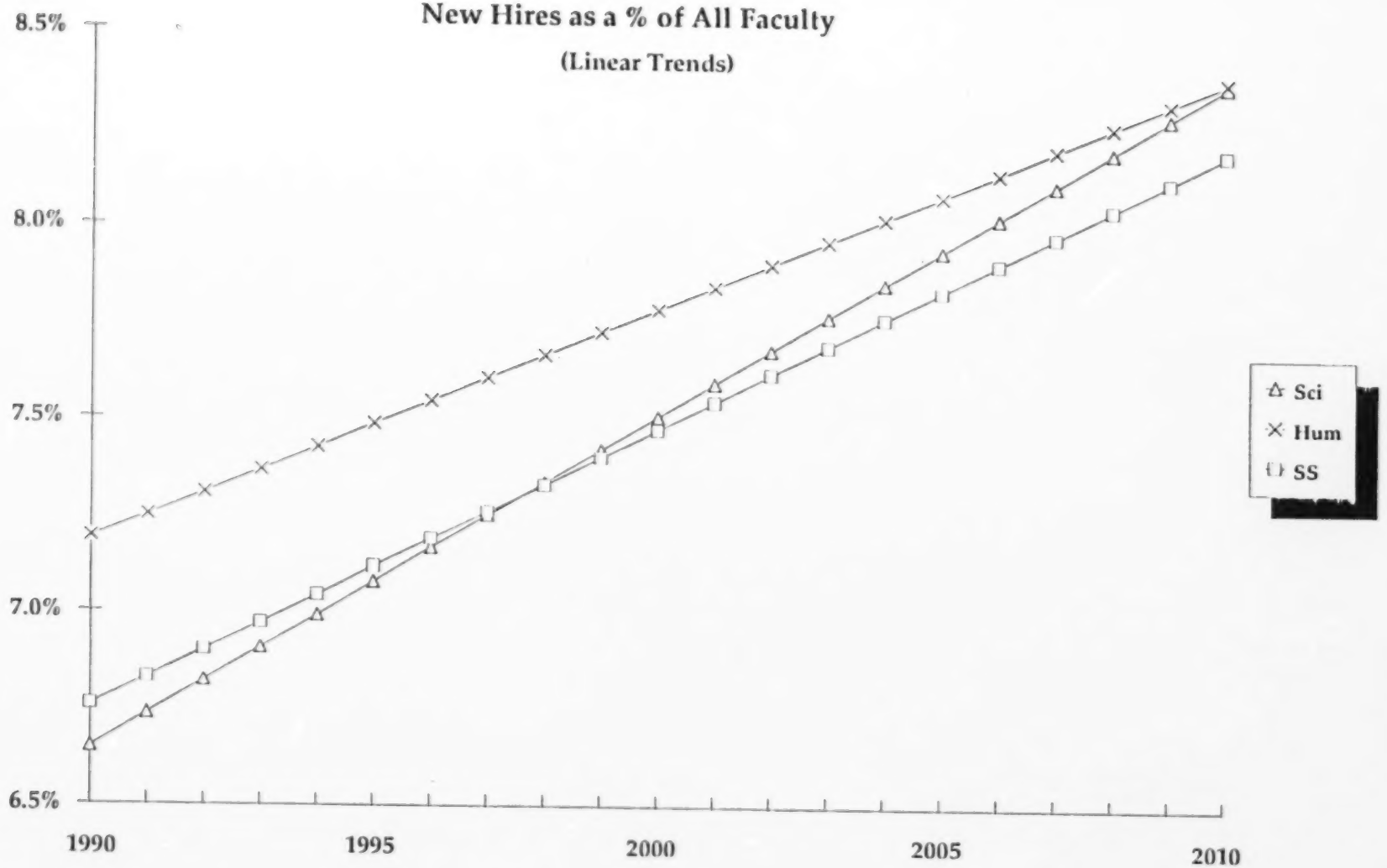

CHART 10

Age Distribution, Natural Sciences

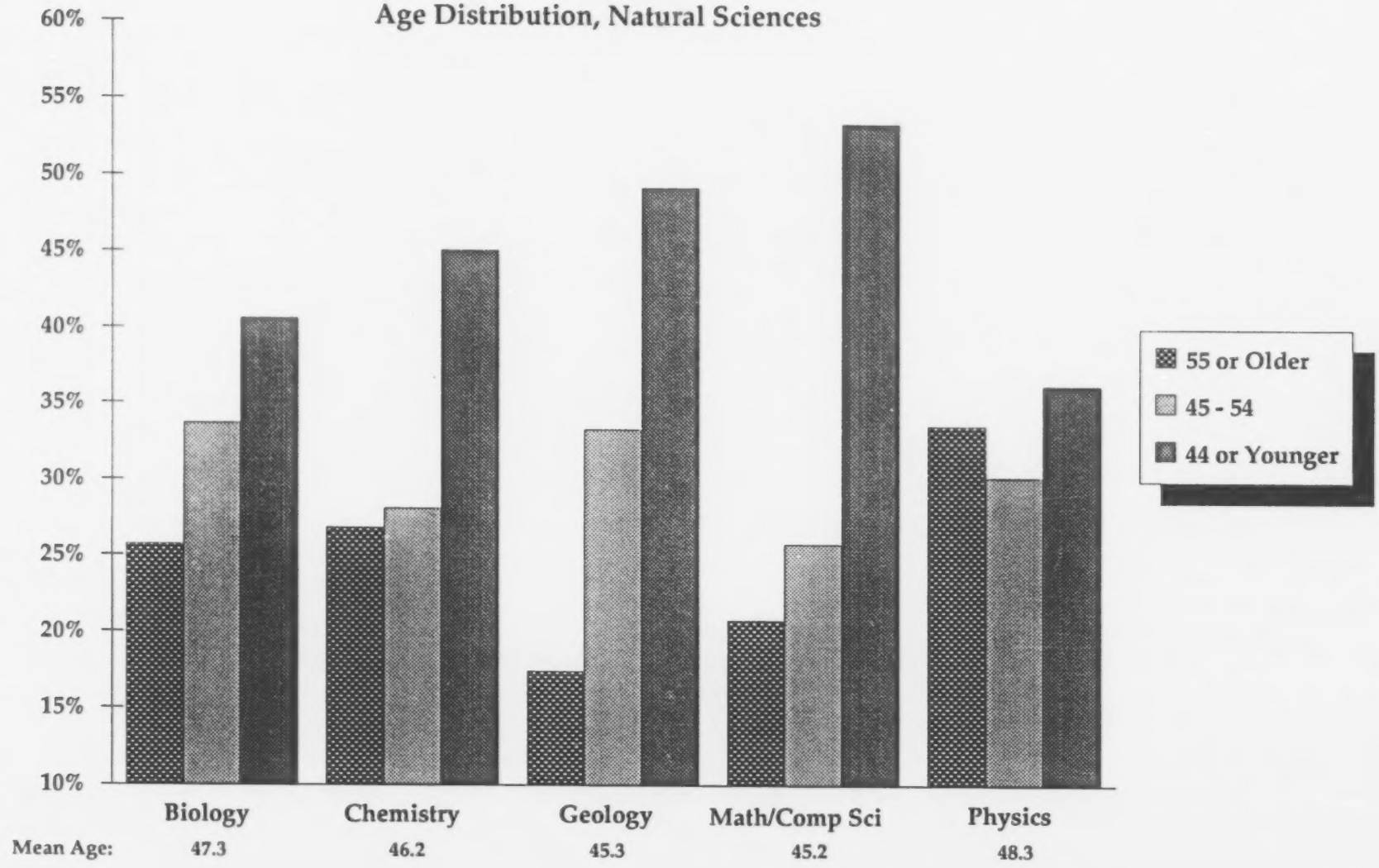

CHART 11

Age Distribution, Humanities

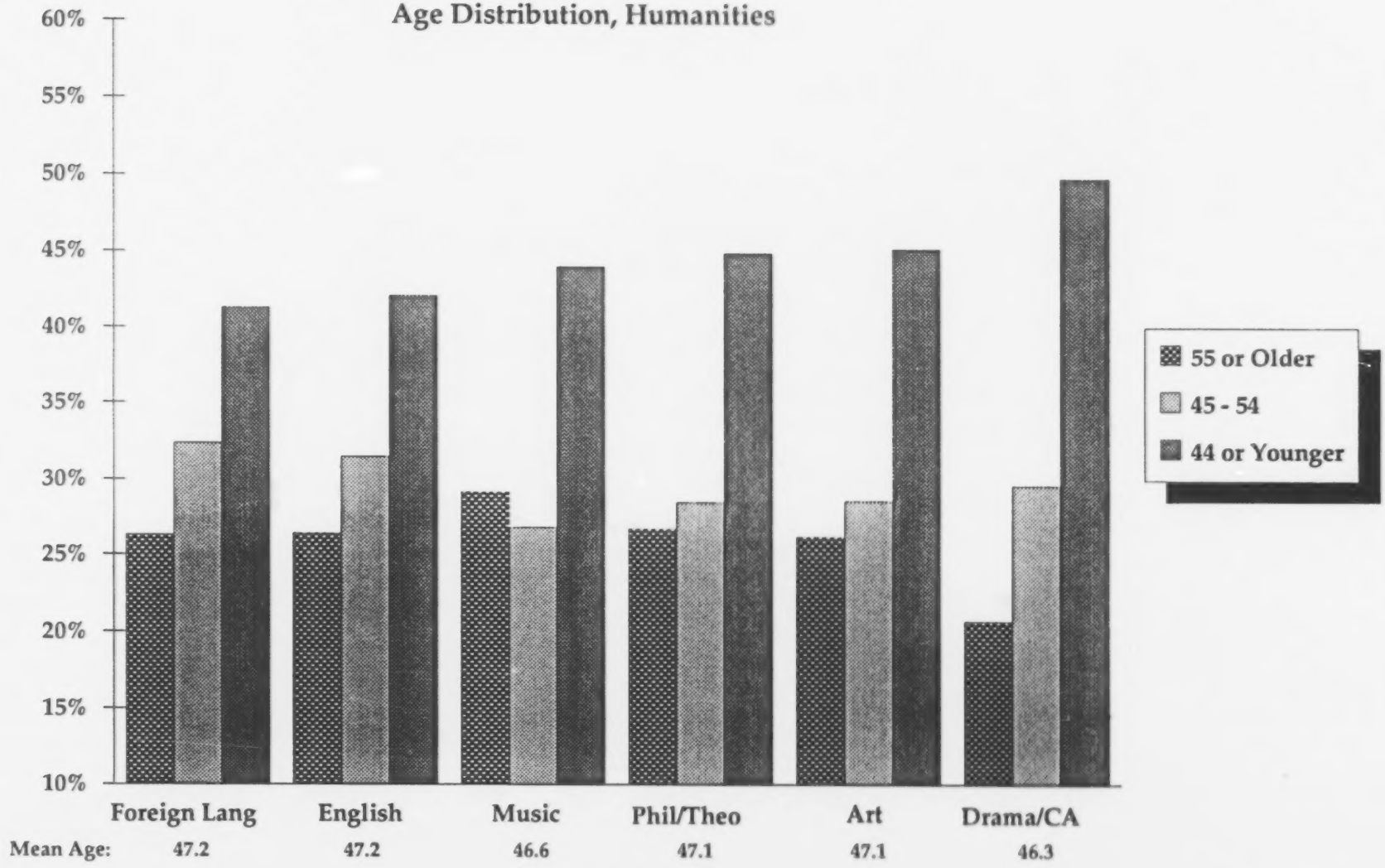

CHART 12

Age Distribution, Social Sciences

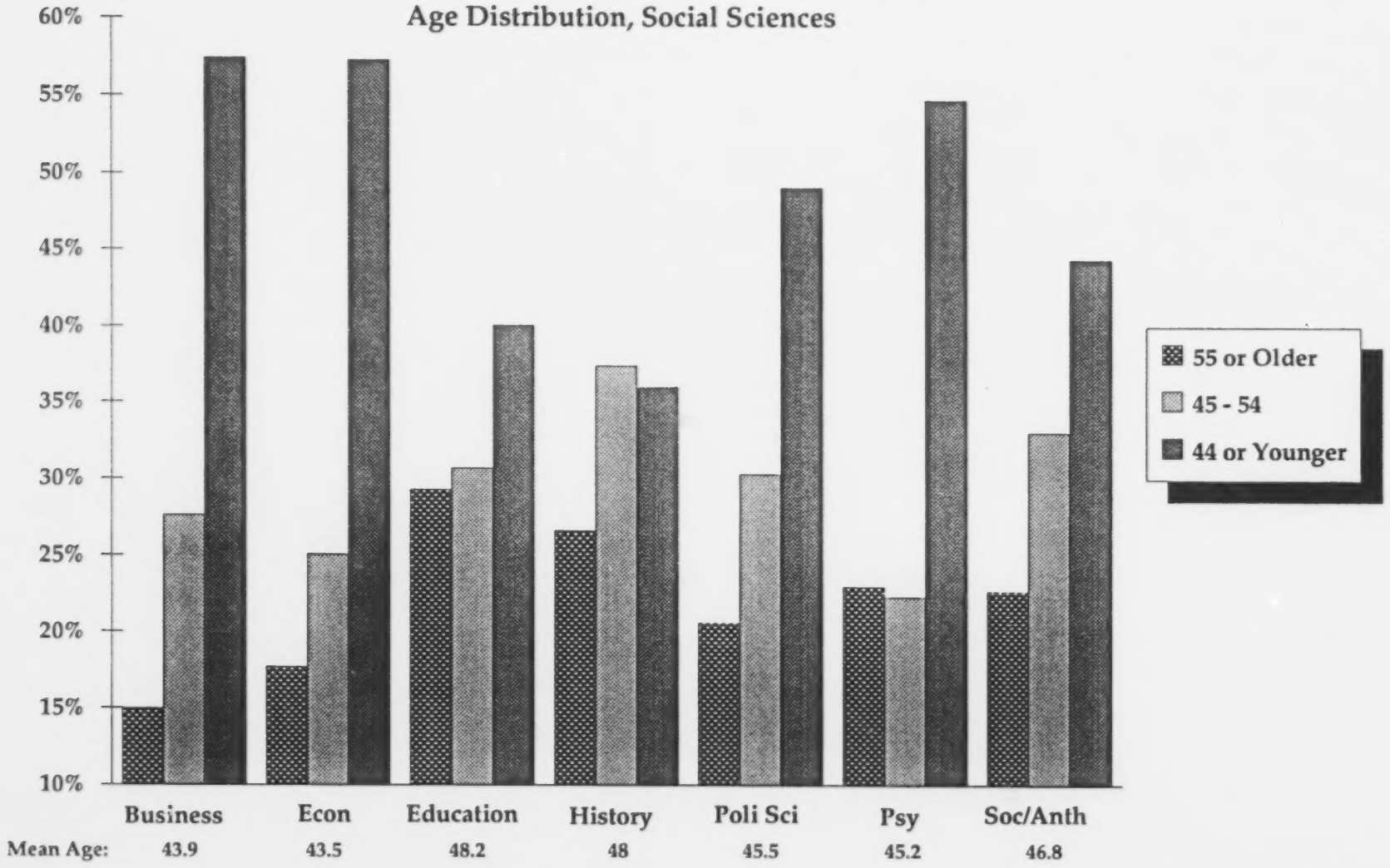

CHART 13

Age Distribution, Other Disciplines

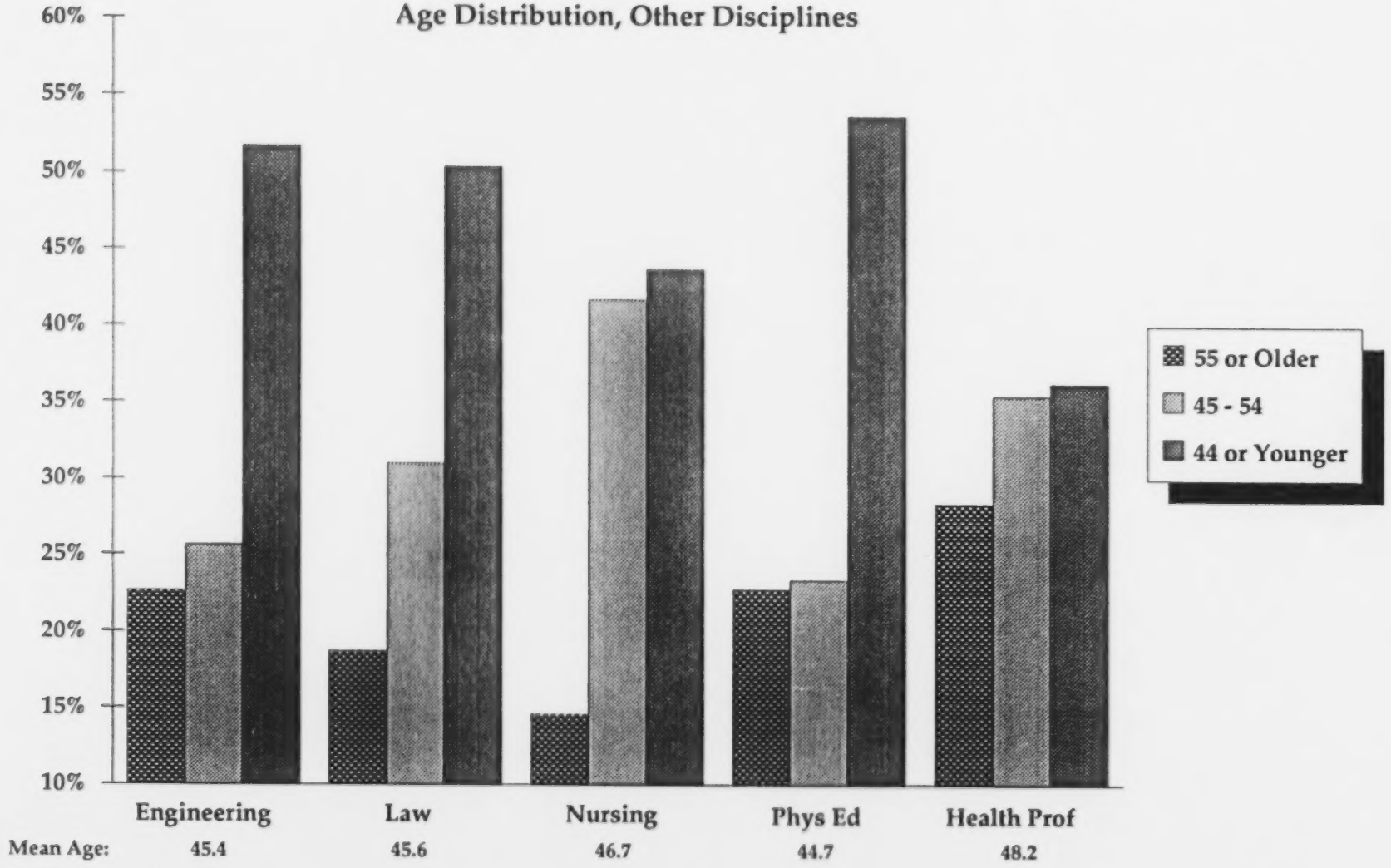

CHART 14

H.S. Graduates & Faculty Hiring Needs, 1990 - 2004

(Standard Scores)

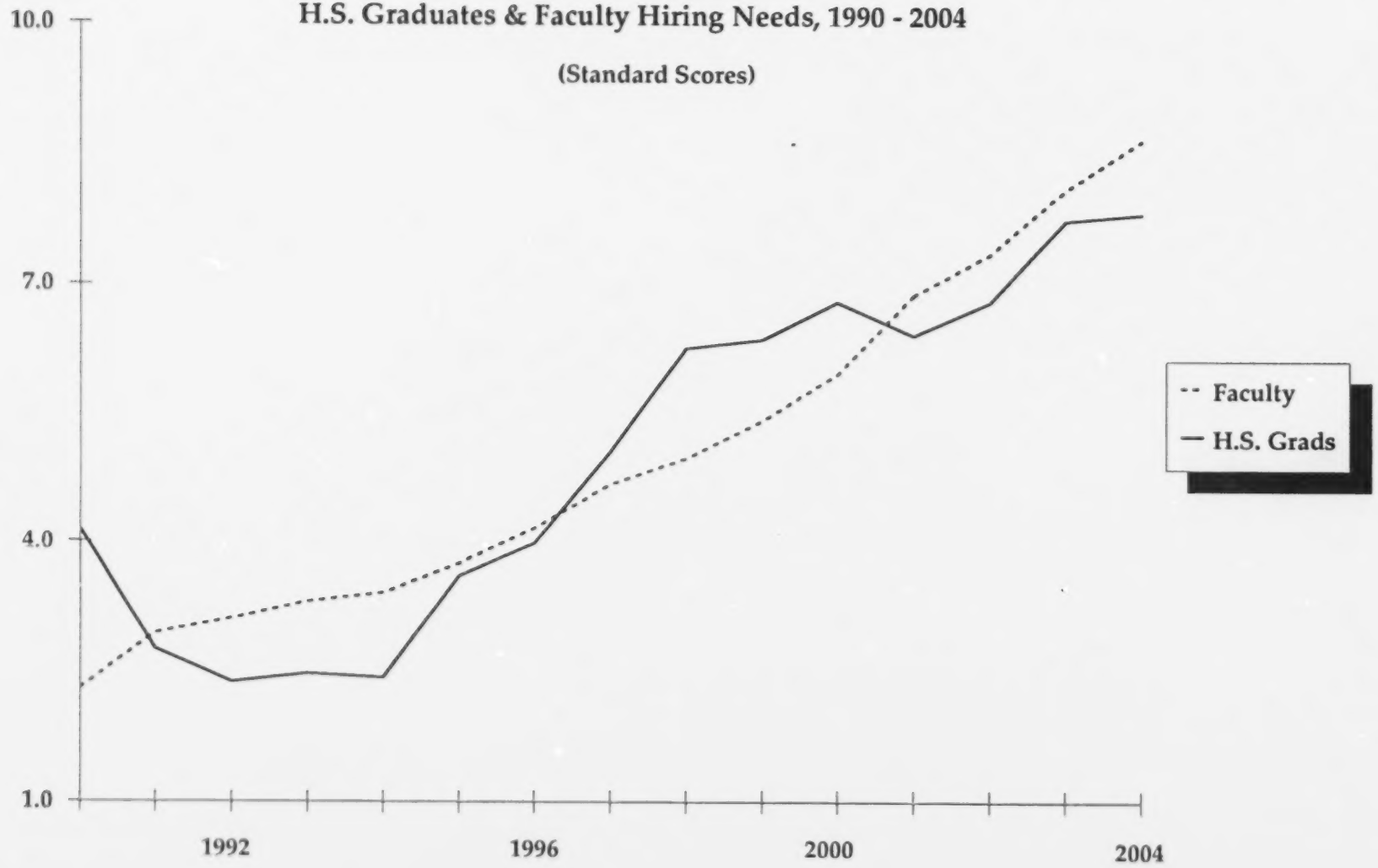

CHART 15

H.S. Graduates & Faculty Hiring Needs, 1990 - 2004

(Linear Trends)

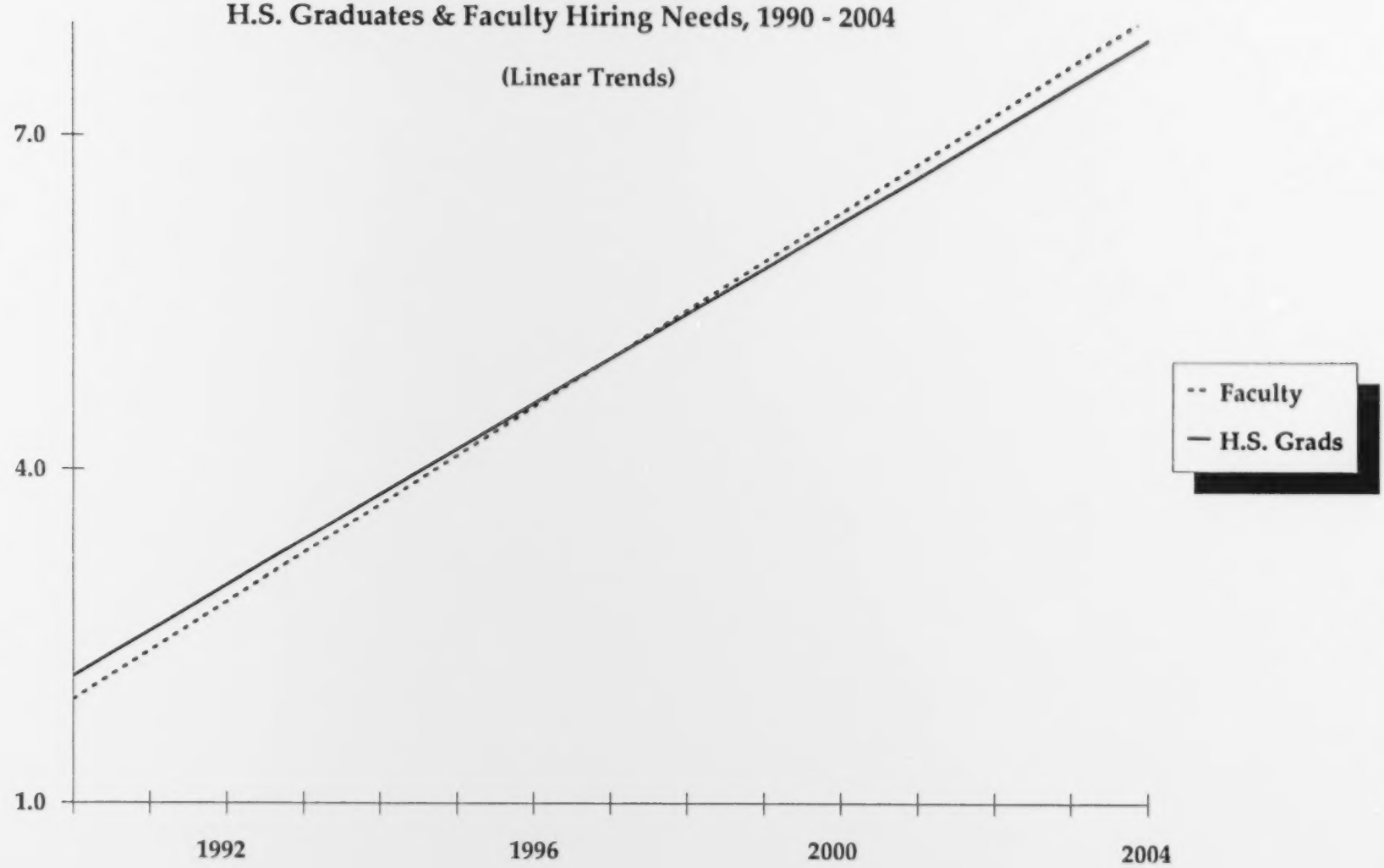

CHART 16

Total Faculty Hiring Needs, Old and New Models

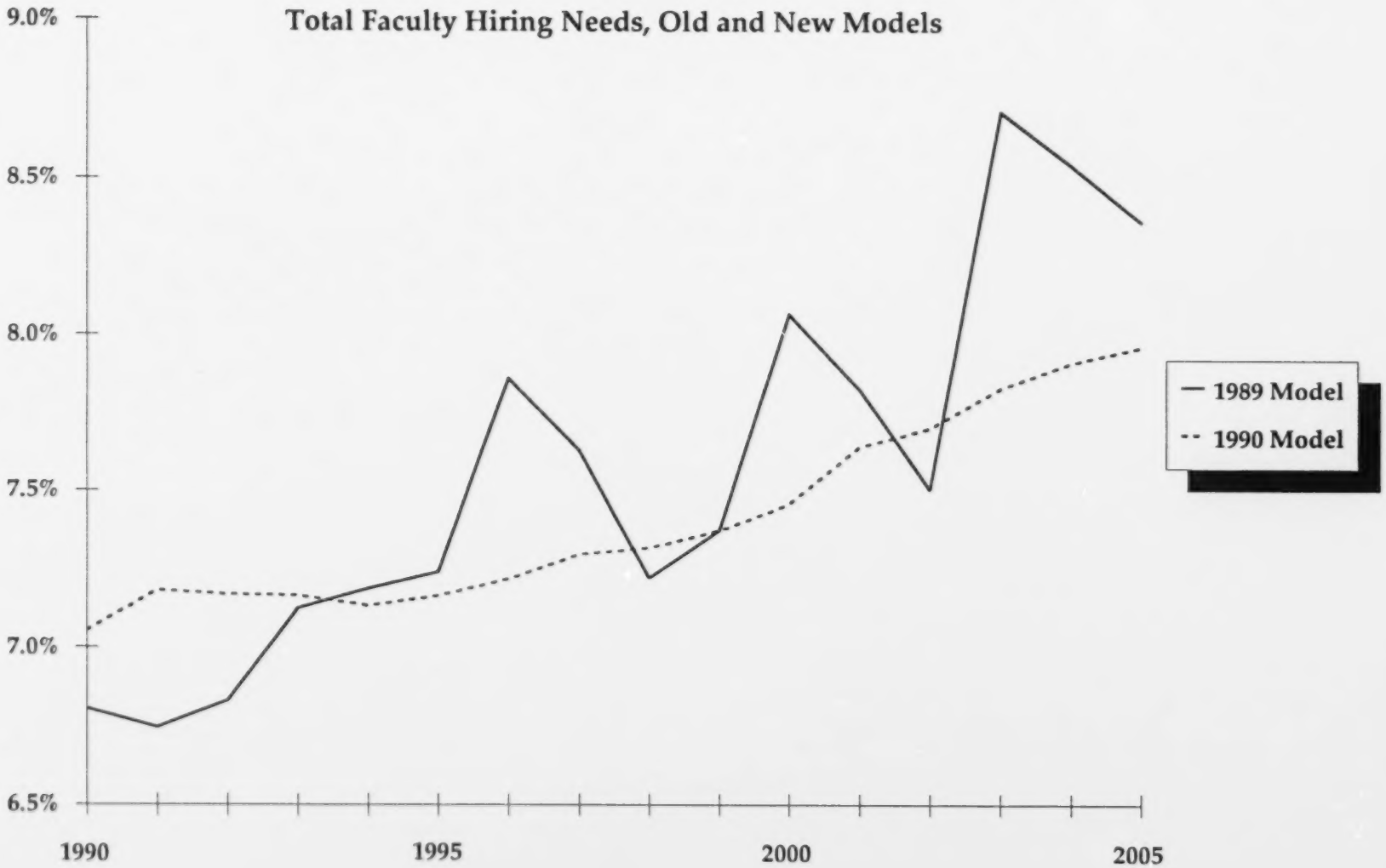

CHART 17

Total Faculty Hiring Needs, Old and Extended New Models

(Linear Trends)

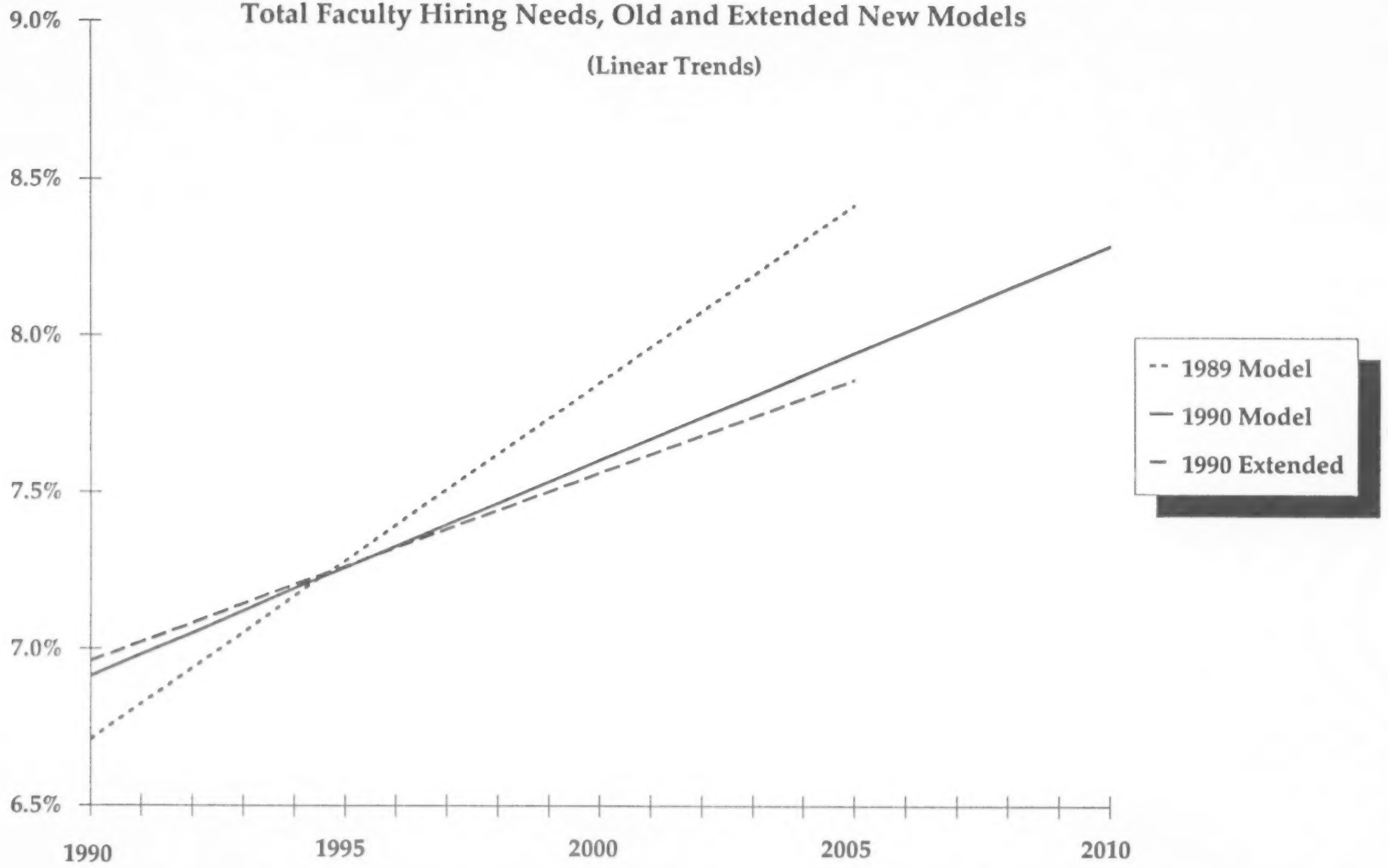

CHART 18

Projected Retirees, Penn State Model vs. F&M Model

(Standard Scores)